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Kouzu

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(54) IMAGE FORMING APPARATUS WITH A ROLLER, A PRESSING PART, A LEVER, A COVER, AND AN ENGAGEMENT PART

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G03G 15/16 (2006.01)

(52) **U.S. Cl.**
CPC ***G03G 21/1638*** (2013.01); ***G03G 15/1615*** (2013.01)

(58) **Field of Classification Search**
CPC G03G 21/1638; G03G 15/1615
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

7,487,967 B2 * 2/2009 Uchida B65H 29/12 399/124
2002/0061212 A1 * 5/2002 Tanaka G03G 15/605 399/379

FOREIGN PATENT DOCUMENTS

JP 2013097372 A 5/2013

* cited by examiner

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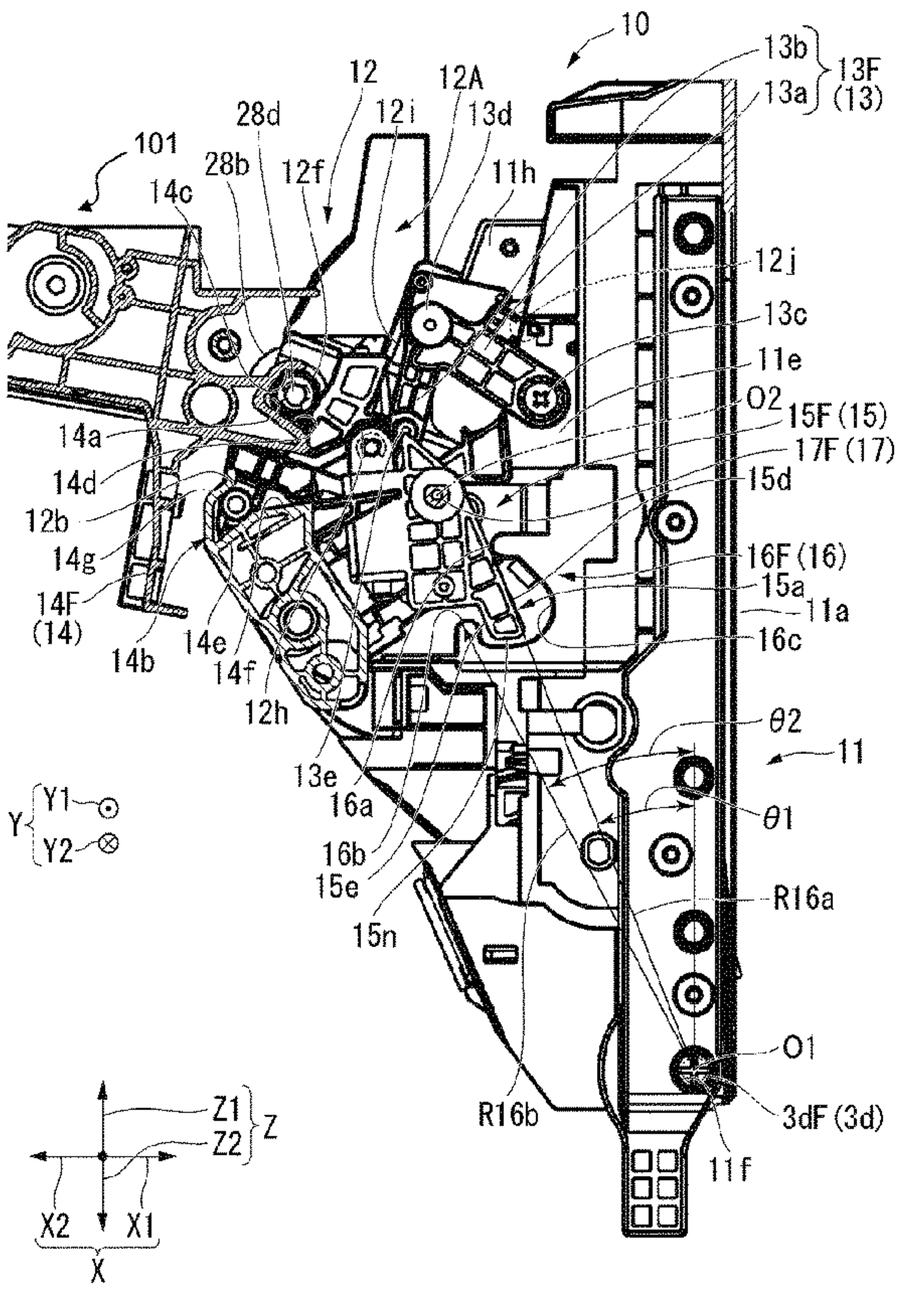
(57) **ABSTRACT**

An image forming apparatus includes a rotating belt in a main body. A roller is supported by a support shaft that moves the roller into contact with the rotating belt and away from the rotating belt. A pressing part in the main body is configured to press the support shaft so that the roller presses against the rotating belt. A lever is provided that when moved causes the pressing part to move between a first position, pressing the support shaft, and a second position, away from the support shaft. A openable and closable cover covers the main body and rotates about a first axis. An engagement part is fixed to the cover and moves with rotation of the cover. The engagement part engages the lever when the cover is closed and releases the lever when the cover is opened.

20 Claims, 11 Drawing Sheets



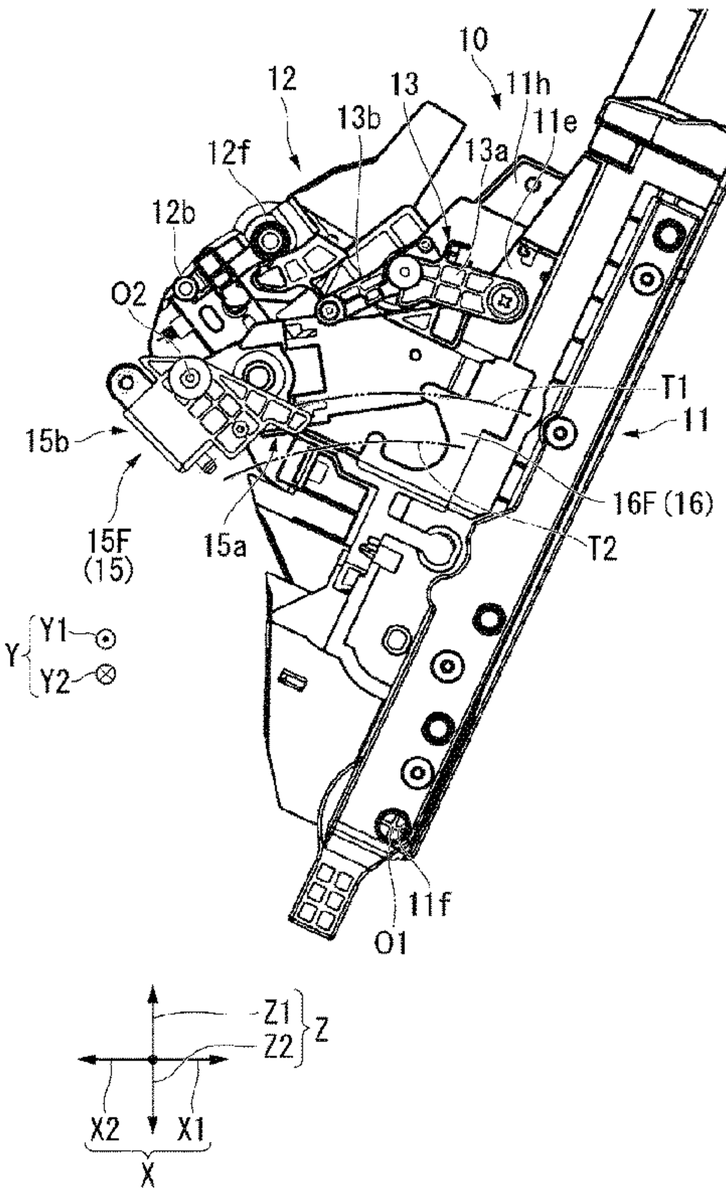
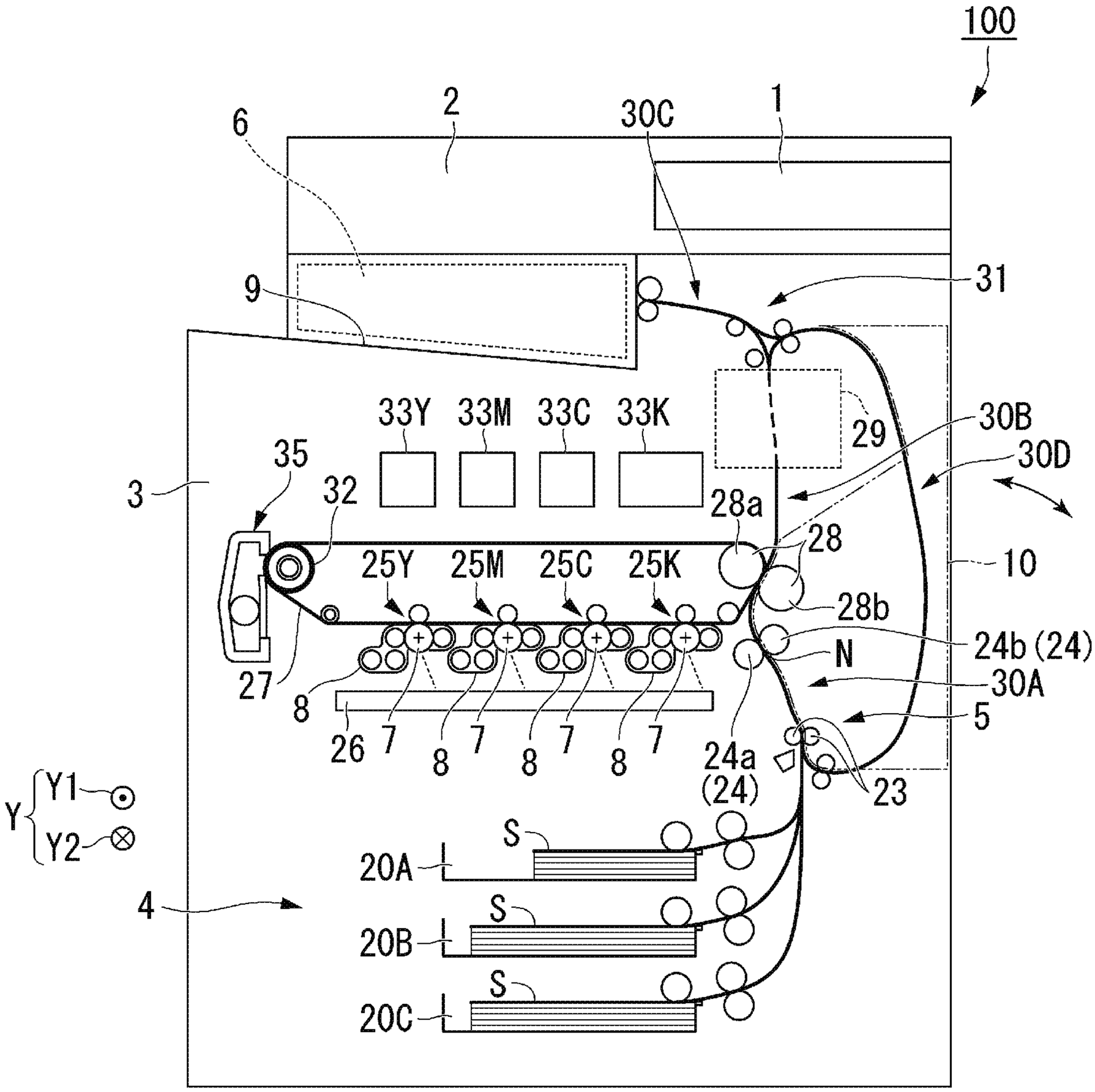


FIG. 1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2
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1
6
9
31
33Y
33M
33C
33K
29
30B
30D
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3
32
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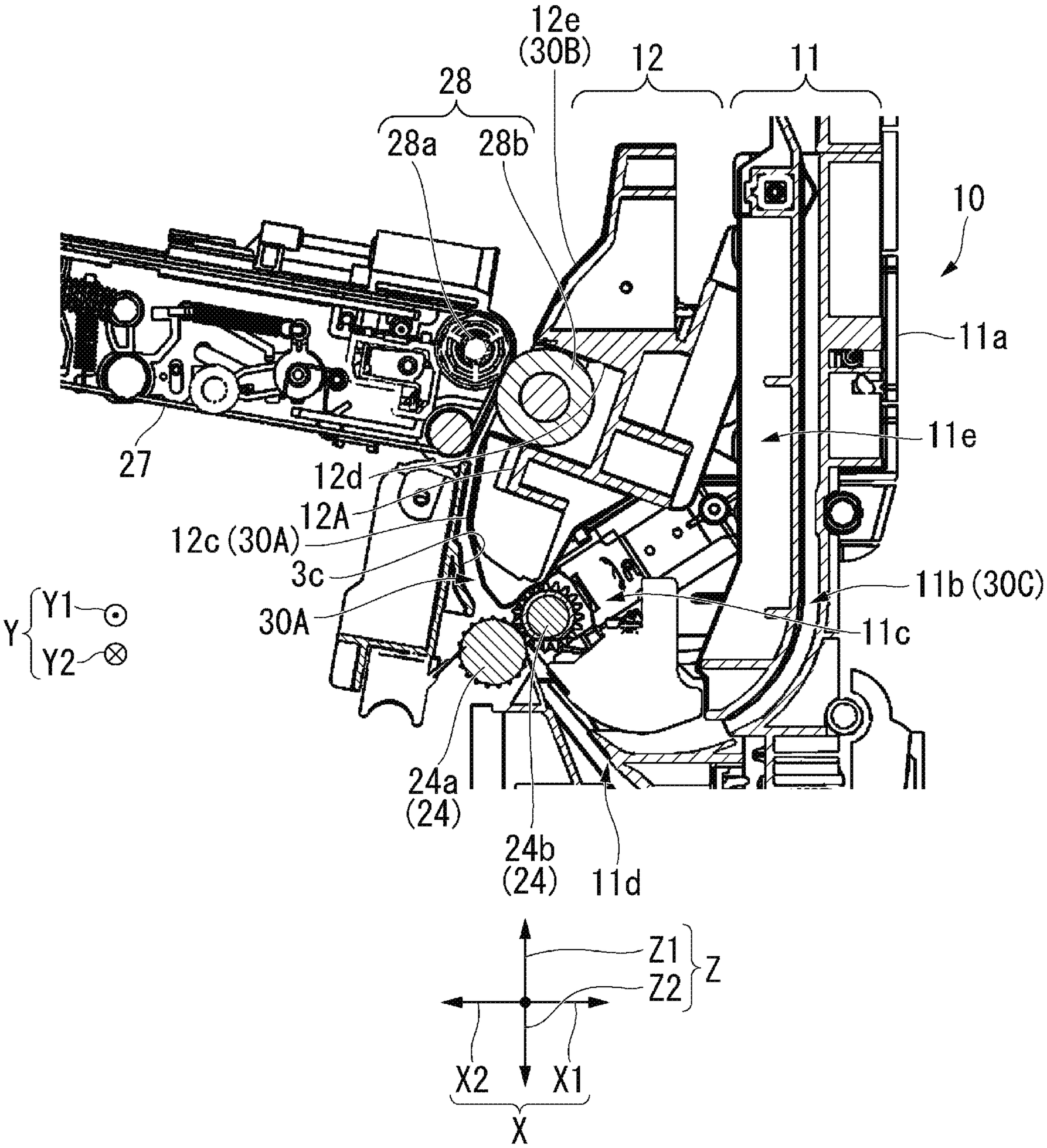
10
25Y
25M
25C
25K
28b
24b (24)
N
30A
27
8
26
7
5
24a (24)
23
Y
Y1
Y2
S
20A
4
20B
20C
Z
Z1
Z2
X
X2
X1

FIG. 2


12e
(30B)
12
11
28
28a
28b
10
11a
11e
27
12d
12A
12c (30A)
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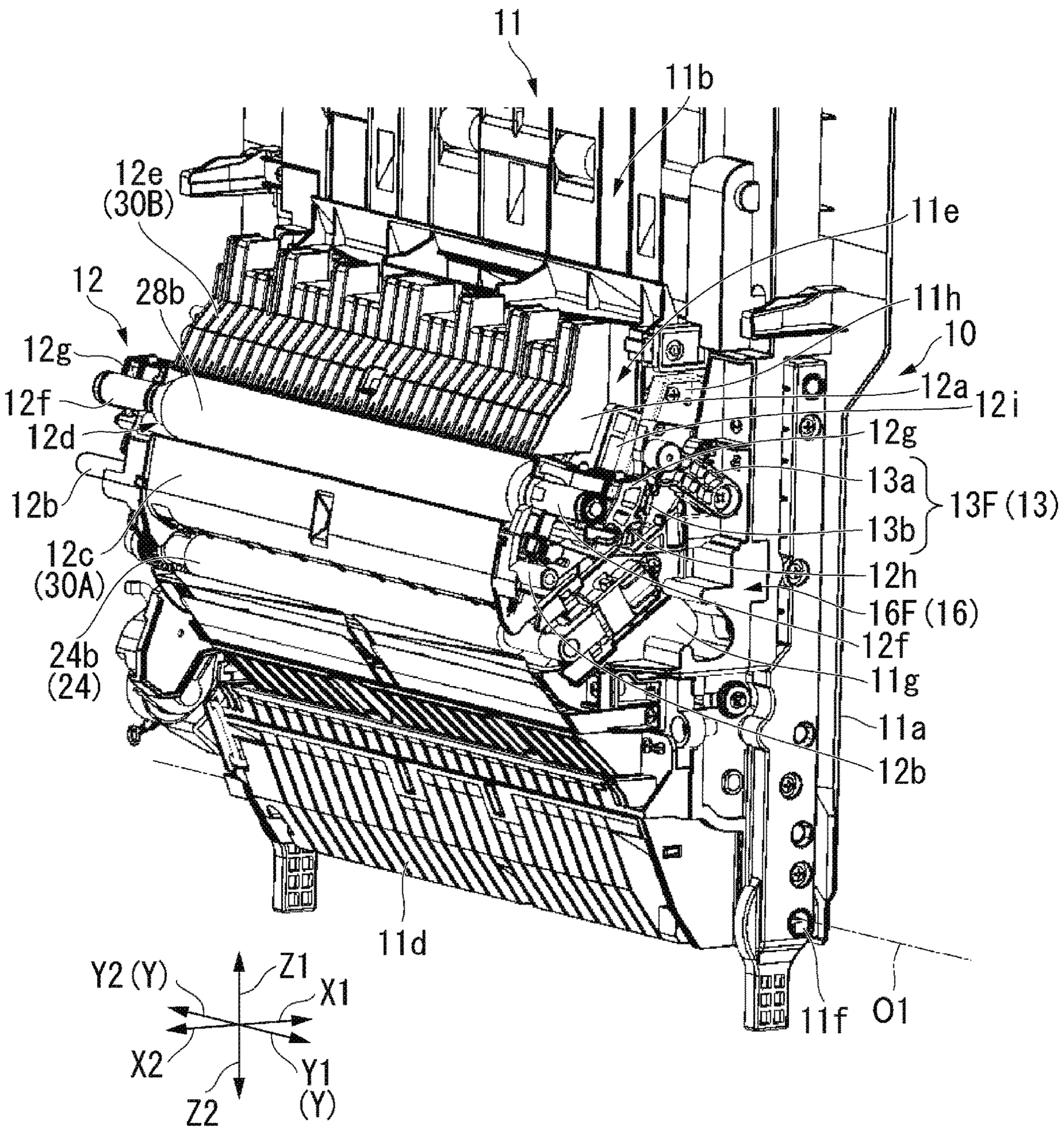
30A
11b (30C)
11c
Y
Y1
Y2
24a
(24)
24b
(24)
11d
Z1
Z2
Z
X2
X1
X

FIG. 3


11
11b
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12
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12f
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12b
12c
(30A)
24b
(24)
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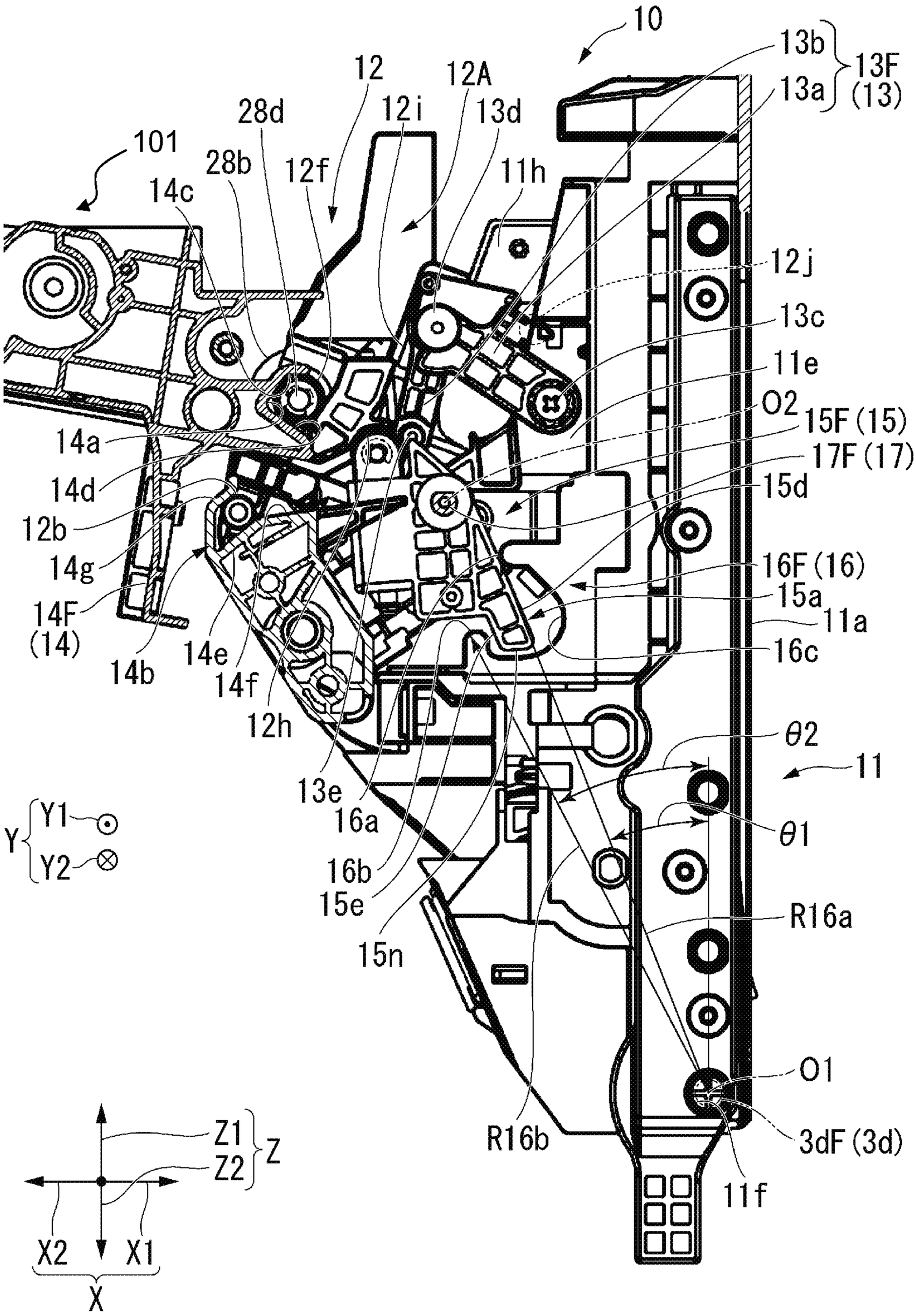
11h
10
12a
12i
12g
13a
13b
13F (13)
12h
16F (16)
12f
11g
11a
12b
11d
11f
O1
Y2 (Y)
Z1
X1
X2
Y1
(Y)
Z2

FIG. 4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13b
13a
13F (13)
12
12A
12i
13d
28d
28b
12f
11h
101
14c
12j
13c
11e
O2
15F (15)
17F (17)
14a
14d
15d
12b
14g
16F (16)
15a
14F (14)
11a
16c
14b
14e
14f
12h
θ2
11
13e
16a
θ1
16b
15e
R16a
15n
O1
R16b
3dF (3d)
11f
Y
Y1
Y2
Z
Z1
Z2
X
X2
X1

FIG. 5

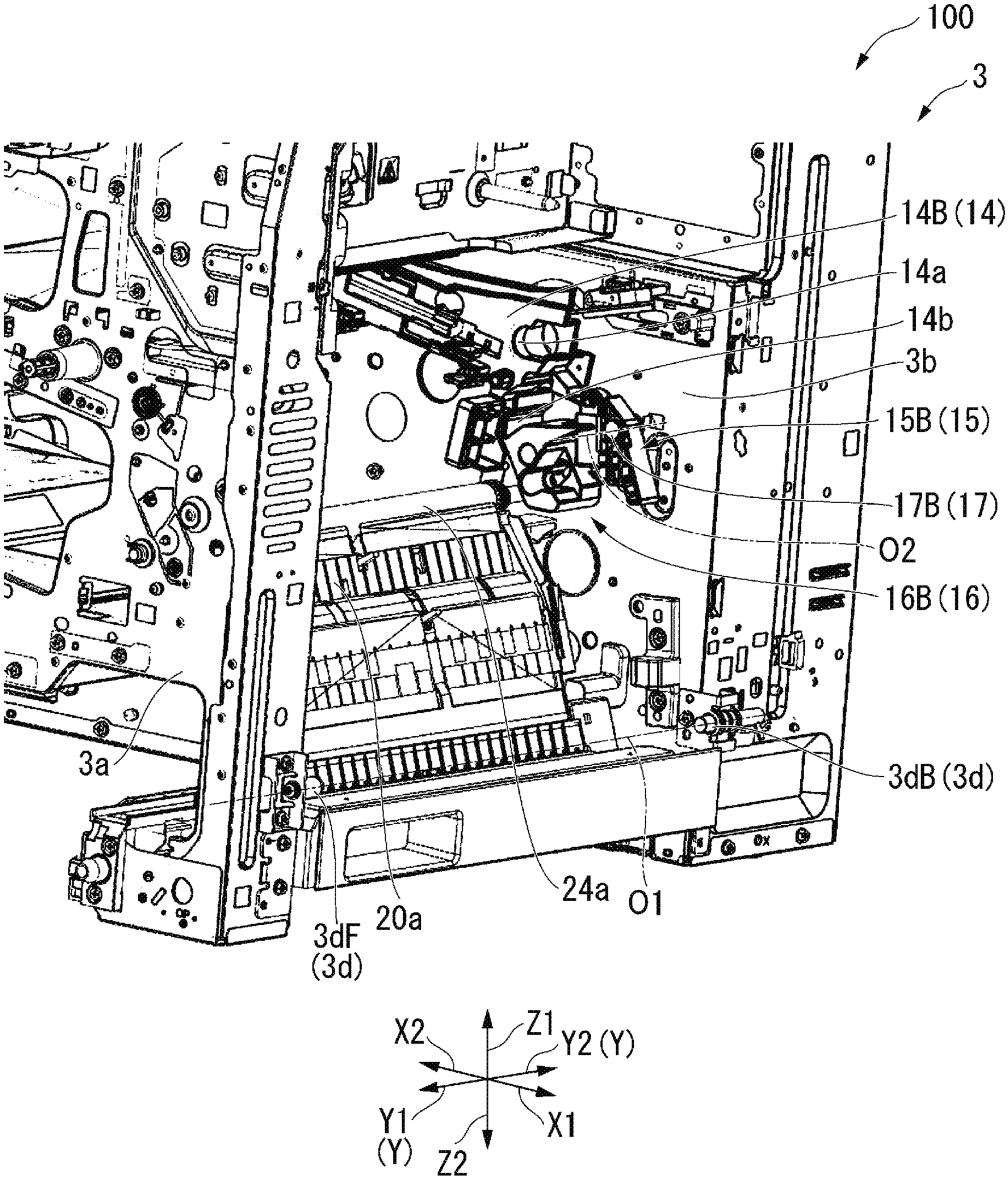
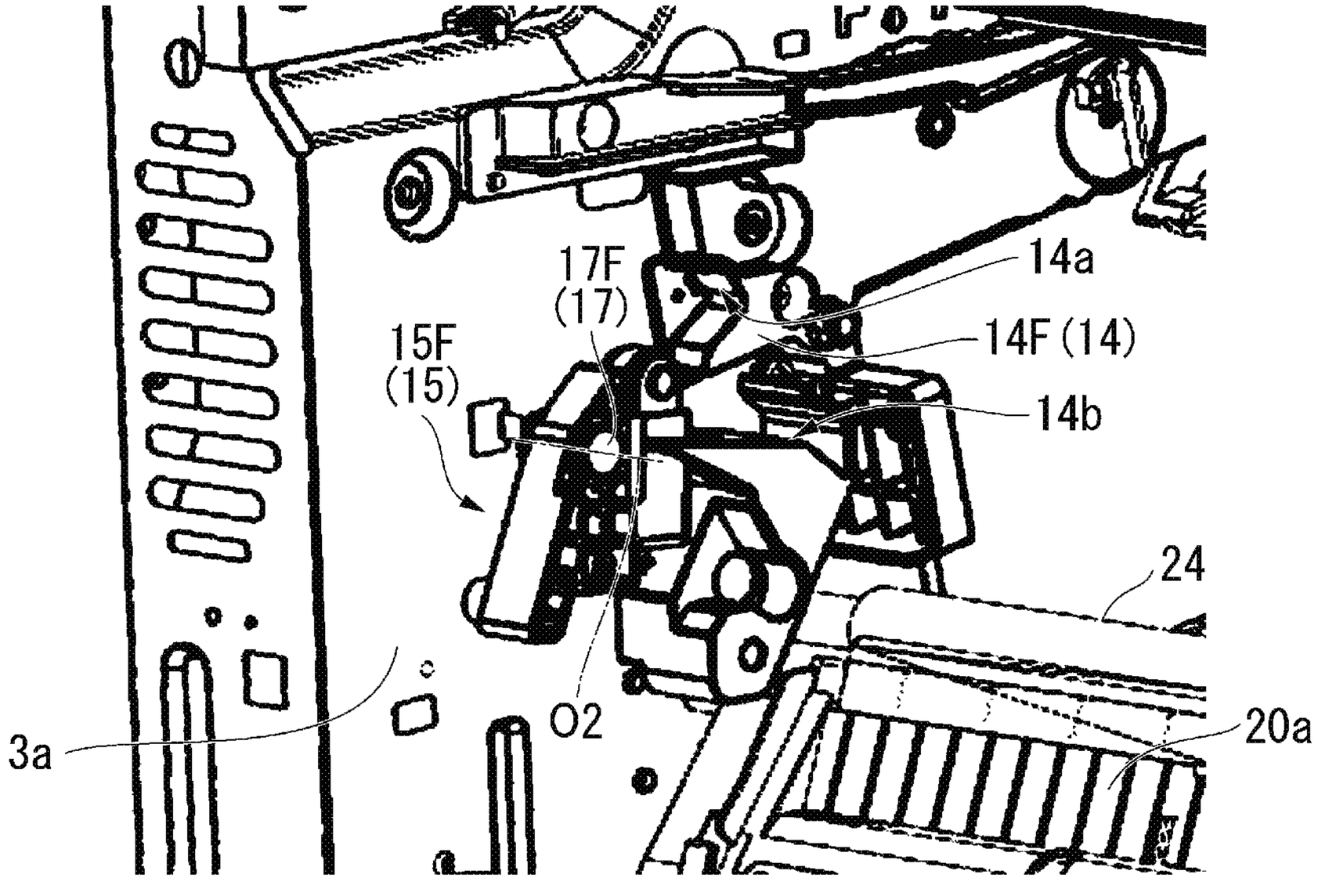

100
3
14B (14)
14a
14b
3b
15B (15)
17B (17)
O2
16B (16)
3dB (3d)
3a
3dF (3d)
20a
24a
O1
X2
Z1
Y2 (Y)
Y1 (Y)
X1
Z2

FIG. 6



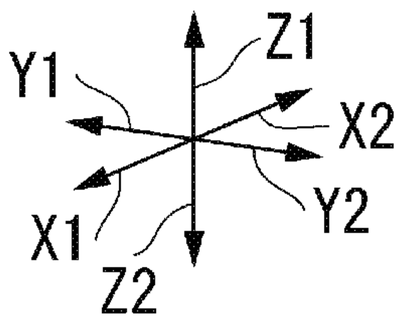
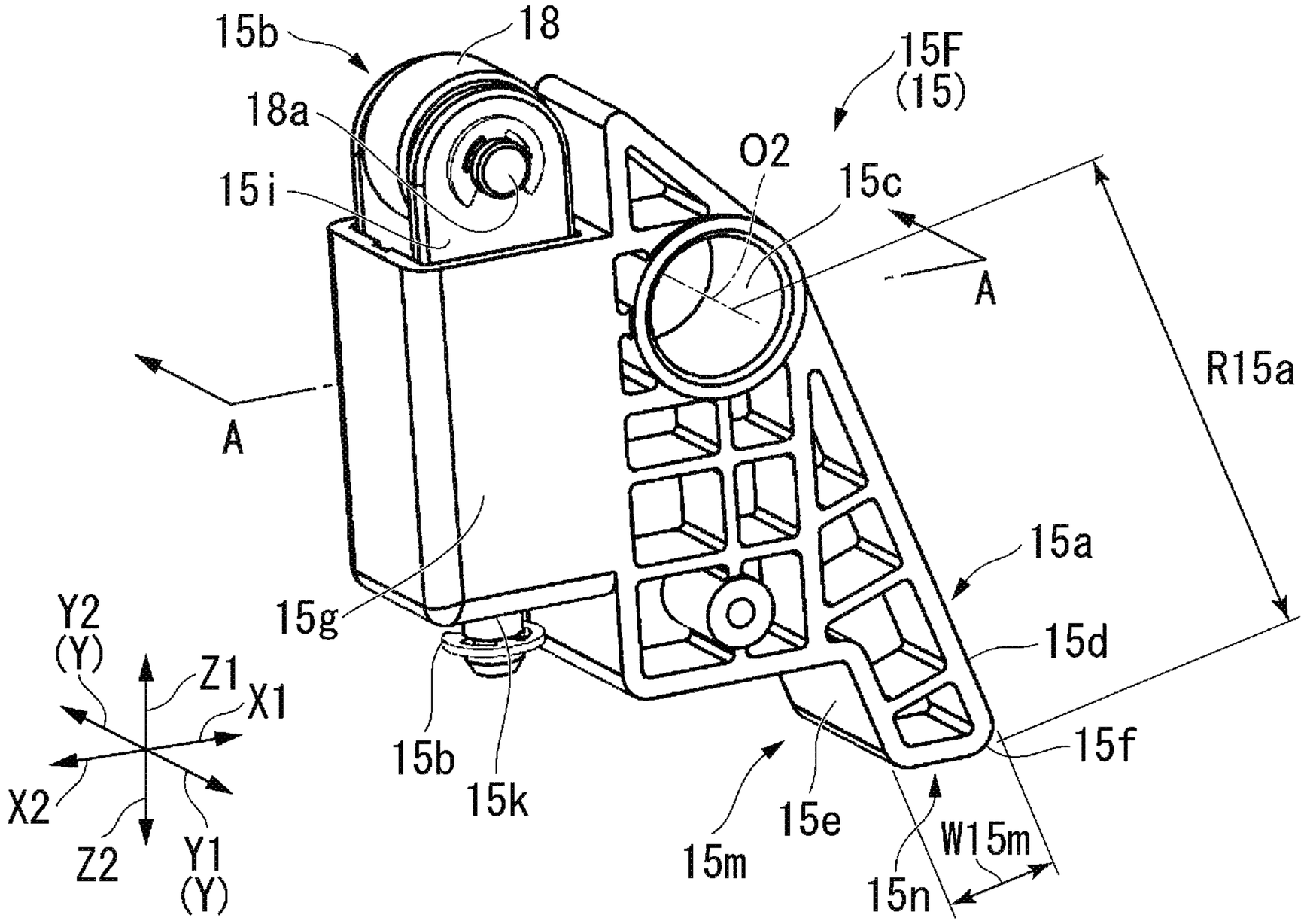


FIG. 7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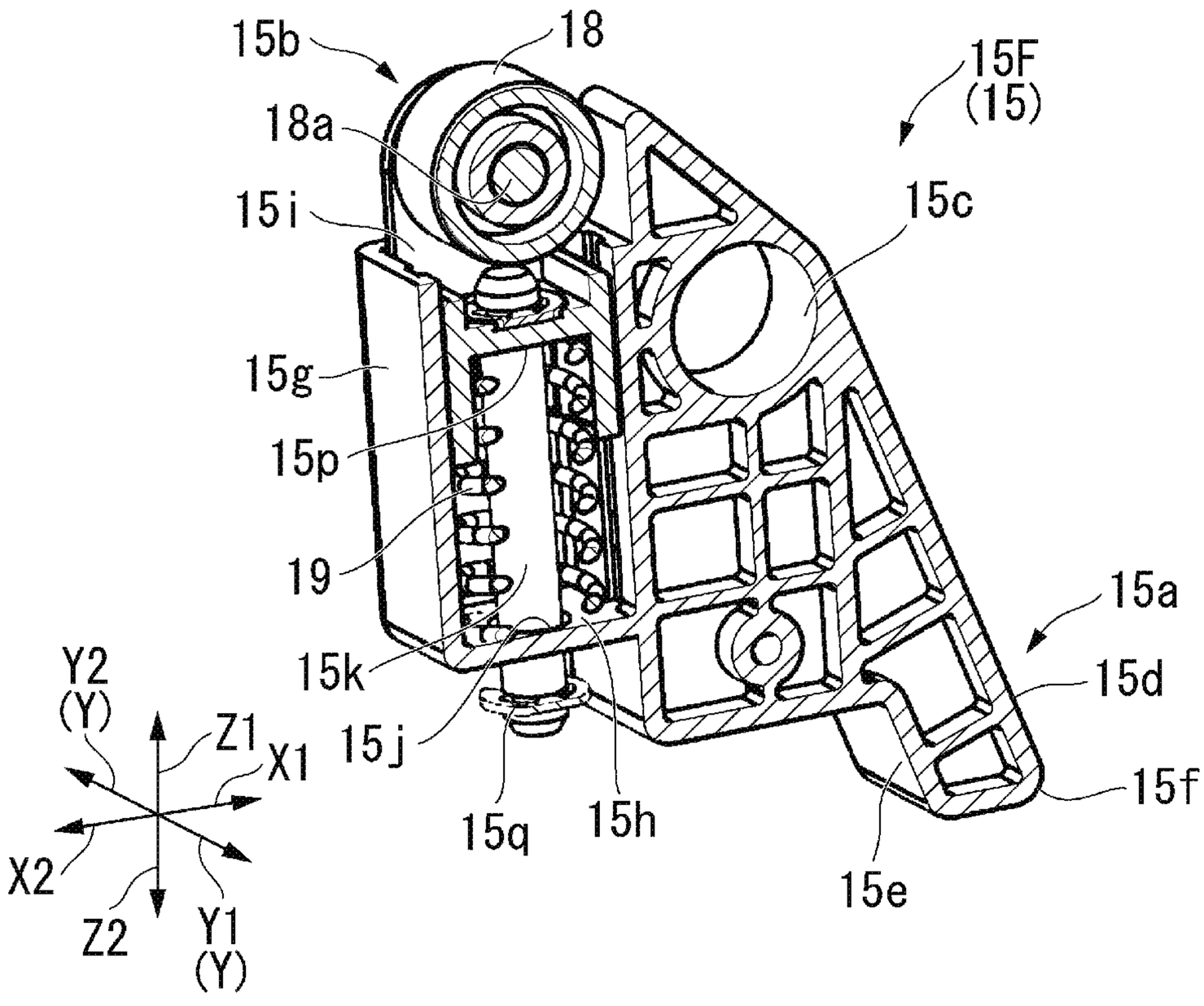
18
18a
15i
15F
(15)
O2
15c
A
A
R15a
15a
15g
15d
15b
15k
15f
15m
15e
W15m
15n
Y2
(Y)
Z1
X1
X2
Z2
Y1
(Y)

FIG. 8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18a
15F
(15)
15i
15c
15g
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15a
15k
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15f
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Z1
X1
X2
Z2
Y1
(Y)

FIG. 9

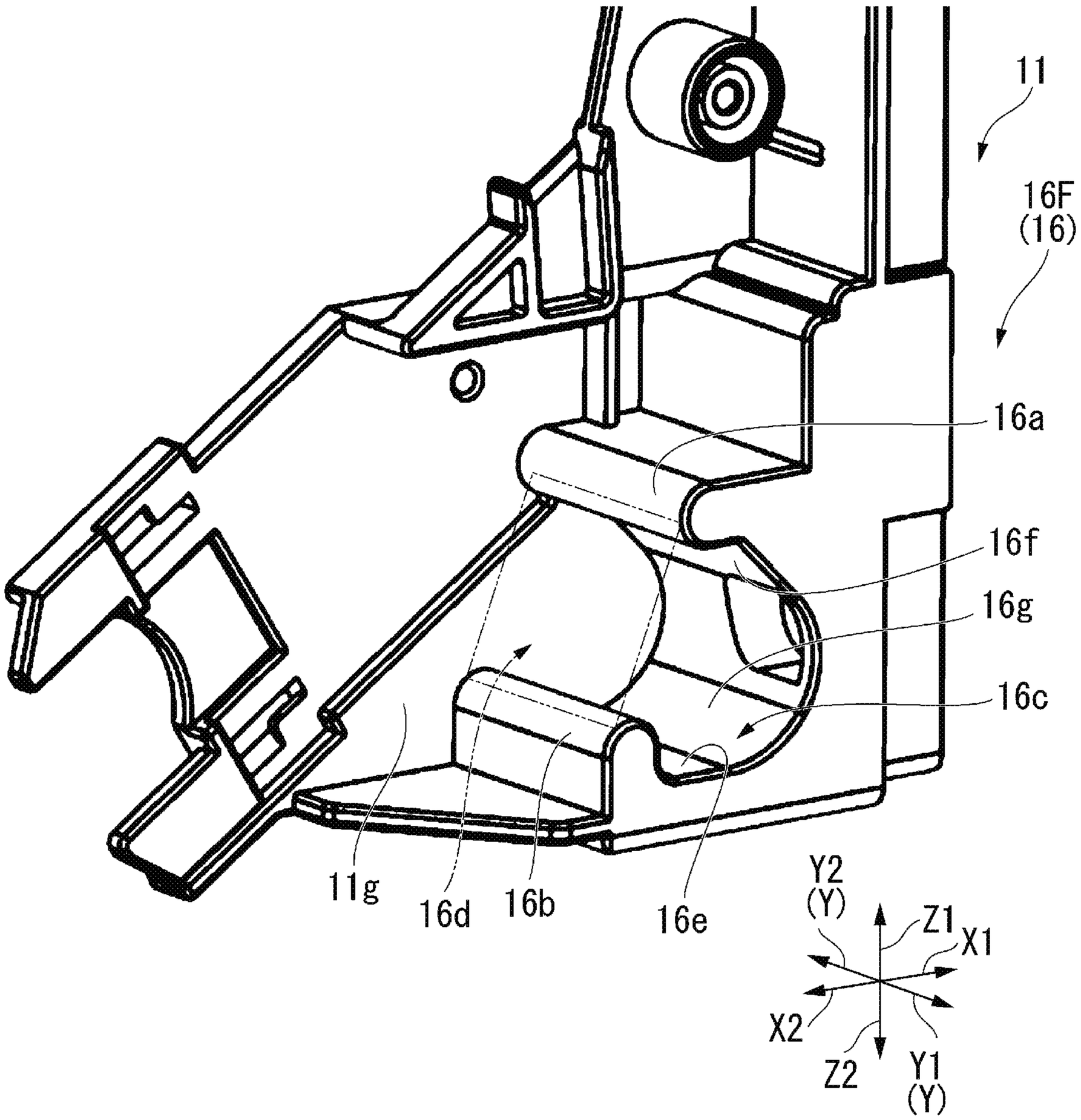
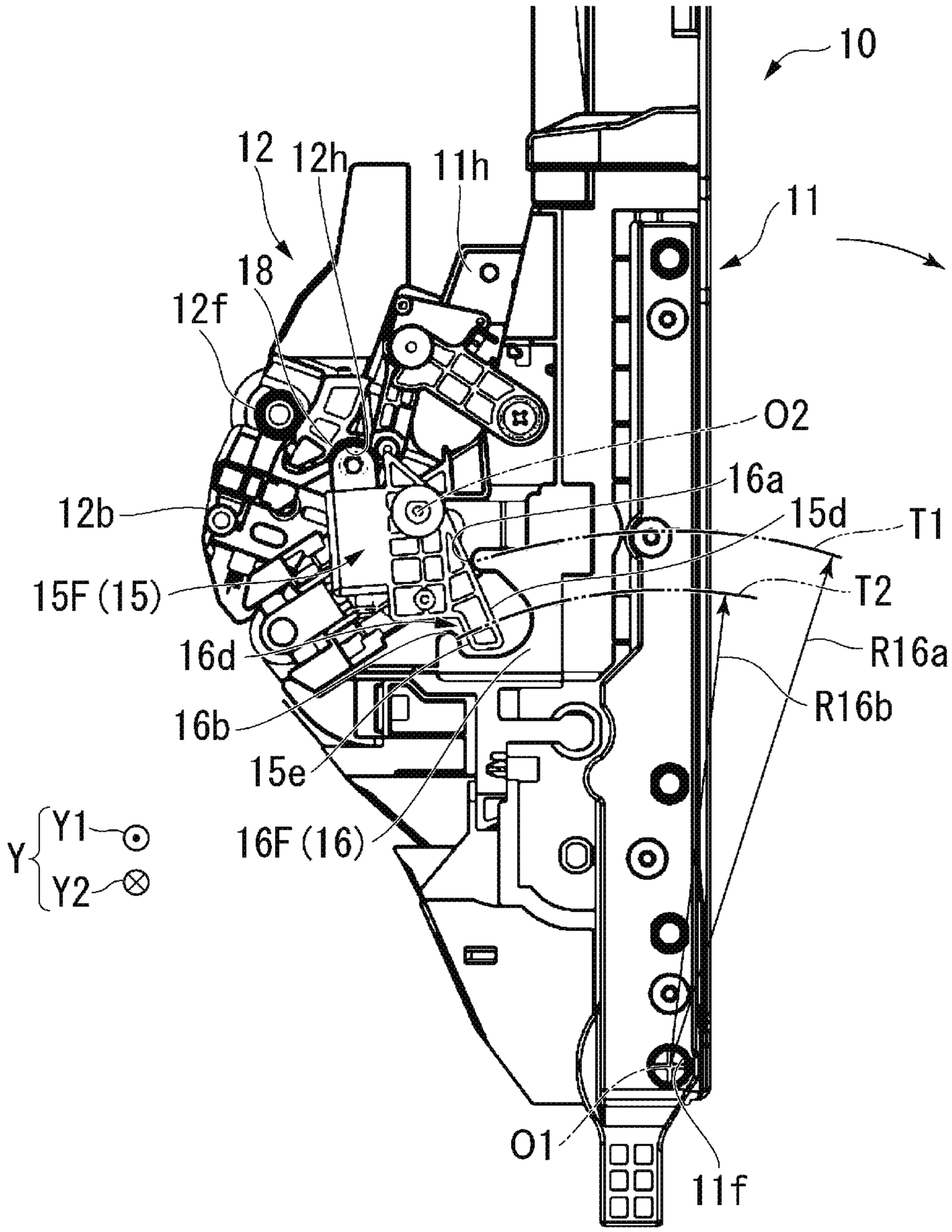


FIG. 10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T1
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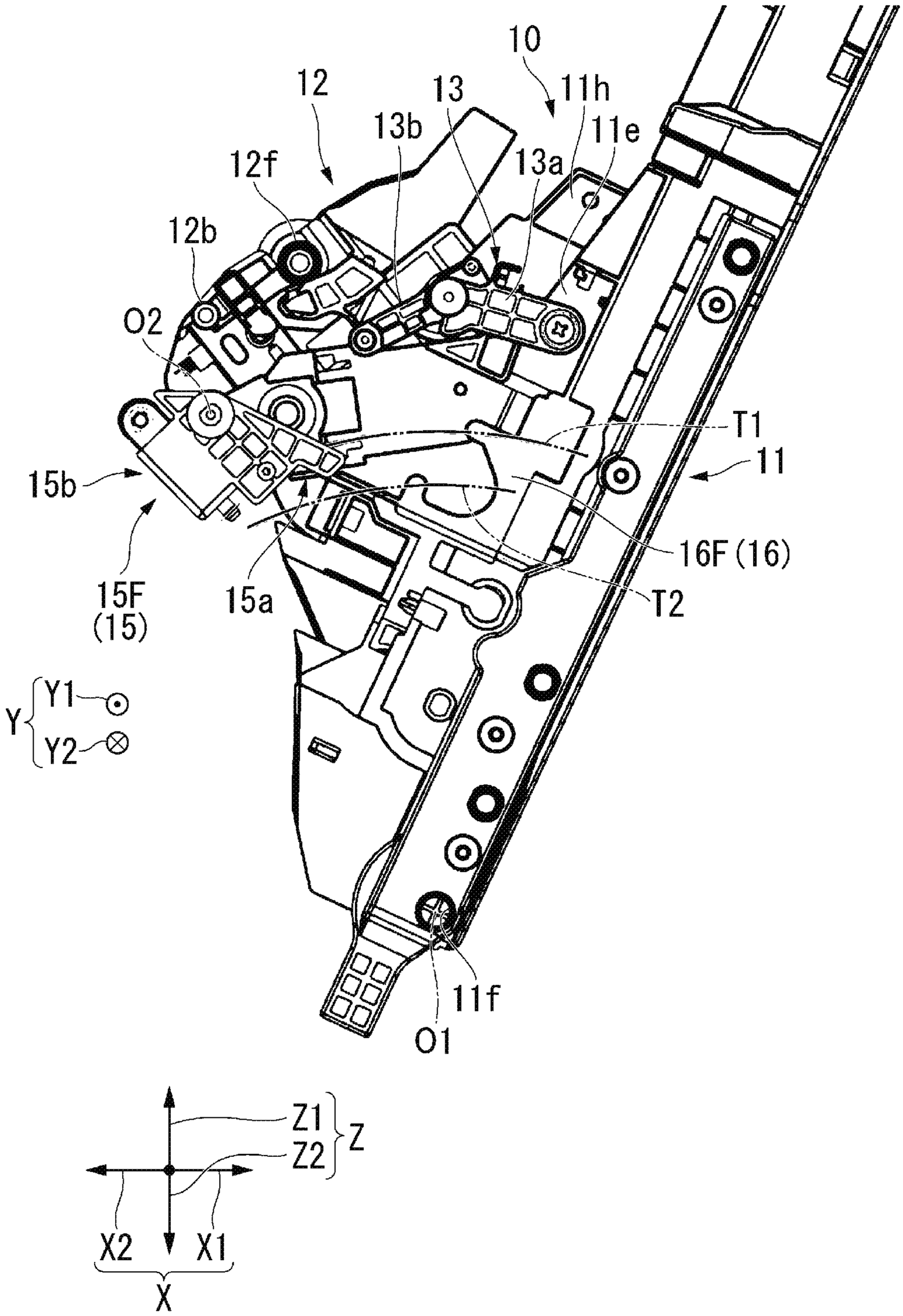
T2
16d
R16a
16b
R16b
15e
16F (16)
Y
Y1
Y2
O1
11f
Z
Z1
Z2
X
X2
X1

FIG. 11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11h
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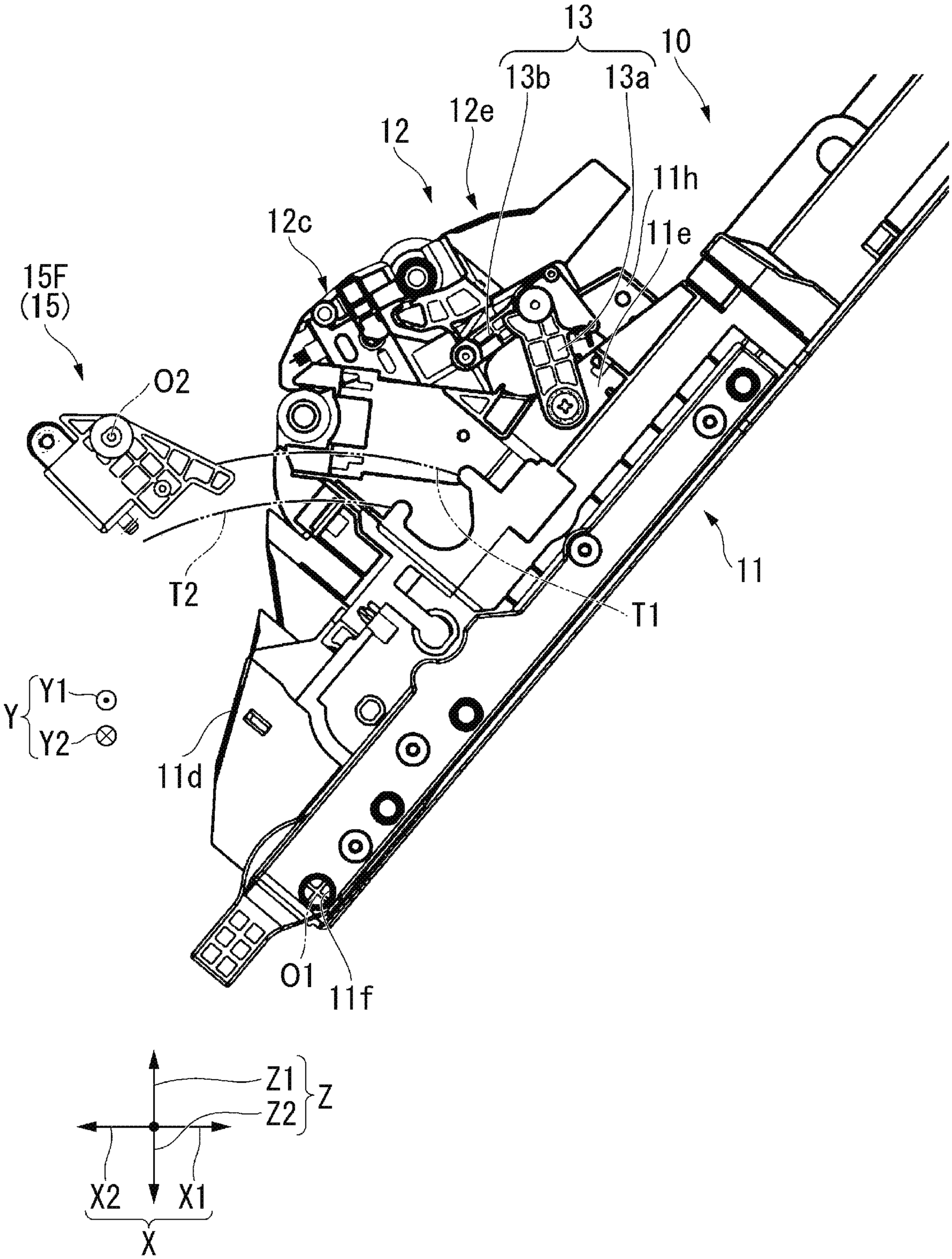
12f
13a
12b
O2
T1
11
15b
16F (16)
15F
(15)
15a
T2
Y
Y1
Y2
11f
O1
Z1
Z2
Z
X2
X1
X

FIG. 12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13b
13a
12e
12
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12c
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15F
(15)
O2
T2
T1
11
Y
Y1
Y2
11d
O1
11f
Z
Z1
Z2
X
X2
X1

IMAGE FORMING APPARATUS WITH A ROLLER, A PRESSING PART, A LEVER, A COVER, AND AN ENGAGEMENT PART

FIELD

Embodiments described herein relate generally to an image forming apparatus.

BACKGROUND

In an image forming apparatus, such as a printer, paper may become jammed along a paper conveyance path. It is desirable that a user can easily remove the jammed paper from the conveyance path. Thus, roller pairs abutting each other along the conveyance path are often provided with a release mechanism to permit release of the paper from between the roller pair.

For example, when the image forming apparatus includes various support rollers that support an intermediate transfer belt or the like from inside the belt's loop along with secondary transfer rollers that face these support rollers, with the intermediate transfer belt interposed therebetween, the secondary transfer rollers may be held in place by a side cover panel of the image forming apparatus housing or the like. The side cover panel is in turn supported by front and rear panels of the image forming apparatus.

In such a case, when the user opens or removes the side cover panel, the secondary transfer rollers, which are connected to the side cover panel, are separated from the intermediate transfer belt. Thus, for example, the paper conveyance path from a registration roller to a secondary transfer position is made accessible. Therefore, the paper jam is more easily removed.

However, when the user closes or replaces the side cover panel, the secondary transfer rollers must be positioned so as to engage a drive roller, via the intermediate transfer belt interposed therebetween, at the secondary transfer position.

When the roller contacts and is separated from another rotating body provided in an apparatus main body in association with the opening and closing of the cover, a contact and separation operation between the roller and the other rotating body may not be smoothly performed. If a relative position with respect to the other rotating body is deviated when the roller abuts thereon, the transfer paper cannot be normally conveyed. Therefore, the roller is required to be firmly positioned at a fixed position in the apparatus main body. Further, the roller positioned at the fixed position is required to be pressed against the other rotating body in order to form a nip with the other rotating body.

Since a pressing force is superimposed on an opening and closing force of the cover depending on a configuration of a mechanism that generates the pressing force when the cover is closed, the cover may not be smoothly opened and closed. In order to improve the opening and closing properties of the cover, the pressing force is also considered to be reduced; however, in this case, the positioning accuracy of the roller may deteriorate.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic cross-sectional view illustrating an example of an overall configuration of an image forming apparatus according to an embodiment.

FIG. **2** is a schematic cross-sectional view illustrating an example of a side cover unit.

FIG. **3** is a schematic perspective view illustrating an example of the side cover unit.

FIG. **4** is a schematic cross-sectional view illustrating a relationship between the side cover unit and an apparatus main body.

FIG. **5** is a schematic perspective view illustrating the inside (rear side view) of the main body.

FIG. **6** is a schematic perspective view illustrating the inside (front side view) of the main body.

FIG. **7** is a schematic perspective view illustrating an example of a pressurizing mechanism.

FIG. **8** is a schematic view of a cross section taken along the line A-A in FIG. **7**.

FIG. **9** is a schematic perspective view illustrating an example of an engagement part.

FIG. **10** is an operation explanatory view of the image forming apparatus according to the embodiment.

FIG. **11** is an operation explanatory view of the image forming apparatus.

FIG. **12** is an operation explanatory view of the image forming apparatus.

DETAILED DESCRIPTION

An image forming apparatus according to an embodiment includes a main body, a rotating belt in the main body; and a roller. The roller is supported by a support shaft that is configured to move the roller into contact with the rotating belt and to separate the roller from rotating belt. A pressing part in the main body is configured to press the support shaft so that the roller presses against the rotating belt. A lever is provided that when moved causes the pressing part to move between a first position pressing the support shaft and a second position away from (separated from) the support shaft. A cover covers an outer periphery of the main body and is rotatably supported about a first axis of a rotating support part in the main body so as to be openable and closable. An engagement part is fixed to the cover and moves on a circular arc around the first axis with rotation of the cover. The engagement part is positioned to engage the lever when the cover is closed such that the lever is at the first position and to release the lever when the cover is opened to permit the lever to move to the second position.

Example Embodiment

Hereinafter, an image forming apparatus according to example embodiments will be described with reference to the accompanying drawings. In the following drawings, unless otherwise specified, the same or substantially corresponding aspects and/or elements will be denoted by the same reference labels.

FIG. **1** is a schematic cross-sectional view illustrating an example of an overall configuration of an image forming apparatus according to an embodiment.

As illustrated in FIG. **1**, an image forming apparatus **100** according to an embodiment includes a control panel **1**, a scanner section **2**, a printer section **3**, a sheet supply section **4**, a conveyance mechanism **5**, and a main body control section **6**.

When referring to a relative position in the image forming apparatus **100**, the directional notations X**1** (horizontal, page right in FIG. **1**), X**2** (horizontal, page left in FIG. **1**), Y**1** (outward from page plane in FIG. **1**), Y**2** (inward from page plane in FIG. **1**), Z**1** (vertical, page up in FIG. **1**), and Z**2** (vertical, page down in FIG. **1**) as illustrated in the FIG. **1** may be used. When it is not required to indicate or refer to

a specific direction (orientation) along the depicted X axis, Y axis, or Z axis, then such a direction may be simply referred to as the X, Y, or Z direction as appropriate.

The control panel **1** operates the image forming apparatus **100** according to inputs from a user.

The scanner section **2** reads image information of an object to be copied as light and darkness. The scanner section **2** outputs the read image information to the printer section **3**.

The printer section **3** forms an image on a sheet S based upon the image information from the scanner section **2** or from the outside.

The printer section **3** outputs a toner image using a developer containing toner. The printer section **3** transfers this toner image to the surface of a sheet S. The printer section **3** then fixes the toner image to the sheet S by applying heat and pressure to the toner image on the surface of the sheet S.

The sheet supply section **4** supplies sheets S one by one to the printer section **3** for the printer section **3** to form a toner image thereon.

The sheet supply section **4** includes a plurality of paper feeding cassettes **20**A, **20**B, and **20**C.

The sheet supply section **4** supplies the sheets S required for image formation processing from each of the paper feeding cassettes **20**A, **20**B, and **20**C as necessary. The sheet supply section **4** conveys each sheet S to the conveyance path **5** for the printer section **3**.

The conveyance path **5** includes a conveyance roller **23** and a registration roller pair **24**. The conveyance path **5** conveys each sheet S supplied from the sheet supply section **4** to the registration roller pair **24**.

The registration roller pair **24** conveys the sheet S at a timing for the printer section **3** to transfer the toner image to the sheet S at the appropriate position on the sheet S.

The registration roller pair **24** comprises a first roller **24***a* positioned on the X**2** direction side and a second roller **24***b* positioned on the X**1** direction side. The conveyance path of the sheet S is interposed between first roller **24***a* and the second roller **24***b*.

The first roller **24***a* is rotationally driven by a drive element which is not separately illustrated. The second roller **24***b* can be positioned to contact the first roller **24***a* and can be moved to another position separated from the first roller **24***a*.

The first roller **24***a* and the second roller **24***b* include gears coaxially with respective central axes. The respective gears are engaged (enmeshed) with each other when the second roller **24***b* contacts the first roller **24***a*. The second roller **24***b* receives a drive force from the first roller **24***a* by meshed gears. Accordingly, the second roller **24**B rotates at the same velocity as that of the first roller **24***a* but in a rotational direction opposite to the first roller **24***a*.

The conveyance roller **23** contacts a tip portion (leading edge) of the sheet S against a nip N of the registration roller pair **24**. The conveyance roller **23** adjusts a position of the tip portion of the sheet S by bending the sheet S.

The registration roller pair **24** positions the tip of the sheet S at the nip N. The registration roller pair **24** then conveys the sheet S to a transfer section **28**.

The printer section **3** includes image forming sections **25**Y, **25**M, **25**C, and **25**K, an exposure unit **26**, an intermediate transfer belt **27**, a transfer section **28**, a fixing device **29**, and a transfer belt cleaning unit **35**.

The image forming sections **25**Y, **25**M, **25**C, and **25**K are disposed in this order in the X**1** direction.

Each of the image forming sections **25**Y, **25**M, **25**C, and **25**K forms the toner image on the intermediate transfer belt **27** to be transferred to the sheet S.

The image forming sections **25**Y, **25**M, **25**C, and **25**K each include a photosensitive drum **7**. The image forming sections **25**Y, **25**M, **25**C, and **25**K form yellow, magenta, cyan, and black toner images on the respective photosensitive drums **7**.

A charging device, a developing device **8**, a primary transfer roller, a cleaning unit, and a static eliminator are positioned around the respective photosensitive drums **7**. The primary transfer roller faces the photosensitive drum **7**. The intermediate transfer belt **27** passes between the primary transfer roller and the photosensitive drum **7**. The exposure unit **26** is disposed below the charging device and the developing device **8**.

Toner cartridges **33**Y, **33**M, **33**C, and **33**K are disposed above the image forming sections **25**Y, **25**M, **25**C, and **25**K. The toner cartridges **33**Y, **33**M, **33**C, and **33**K respectively contain yellow, magenta, cyan, and black toners.

The toners from the respective toner cartridges **33**Y, **33**M, **33**C, and **33**K are supplied to the image forming sections **25**Y, **25**M, **25**C, and **25**K by a toner supply pipe, duct or the like.

The exposure unit **26** irradiates a surface of the charged photosensitive drums **7** with light such as a laser beam. The emission of the light is controlled based upon the image information (e.g., the image data for the intended image and/or text to be printed). A configuration in which the exposure unit **26** incorporates LED light(s) instead of a laser can also be adopted. In the example illustrated in FIG. **1**, the exposure unit **26** is disposed below the image forming sections **25**Y, **25**M, **25**C, and **25**K.

The image information corresponding to yellow, magenta, cyan, and black portions of an image to be formed is supplied to the exposure unit **26**.

The exposure unit **26** forms an electrostatic latent image based upon the image information on the surface of each photosensitive drum **7**.

The intermediate transfer belt **27** is, for example, a closed loop, which may be referred to as an endless belt. A tension is applied to the intermediate transfer belt **27** by a plurality of rollers abutting on an inner peripheral (inside) surface of the intermediate transfer belt **27**. The intermediate transfer belt **27** is stretched to have a flat portion. In this example, the inner peripheral surface of the intermediate transfer belt **27** abuts on a support roller **28***a* at a position in the X**1** direction that is farthest along the stretching direction/dimension. The inner peripheral surface of the intermediate transfer belt **27** abuts on a transfer belt roller **32** at a position in the X**2** direction that is most separated in the stretching direction/dimension from the support roller **28***a*.

The support roller **28***a* forms a part of the transfer section **28**. The support roller **28***a* guides the intermediate transfer belt **27** to the secondary transfer position.

The transfer belt roller **32** guides the intermediate transfer belt **27** to a cleaning position.

The image forming sections **25**Y, **25**M, **25**C, and **25**K excluding the primary transfer roller are disposed in this order in the X**1** direction on the lower surface side of the intermediate transfer belt **27** illustrated in the drawing. The image forming sections **25**Y, **25**M, **25**C, and **25**K are disposed in a region between the transfer belt roller **32** and the support roller **28***a* with a space therebetween.

When the toner image reaches a primary transfer position, a transfer bias is applied to each of the primary transfer rollers of the image forming sections **25**Y, **25**M, **25**C, and

25K. Each primary transfer roller transfers the toner image from the surface of each photosensitive drum **7** onto the intermediate transfer belt **27**. This transfer is referred to as a primary transfer.

In the intermediate transfer belt **27**, the transfer section **28** is disposed at a position adjacent or nearest to the image forming section **25**K.

The transfer section **28** includes the support roller **28***a* and a secondary transfer roller **28***b*. The intermediate transfer belt **27** passes between the secondary transfer roller **28***b* and the support roller **28***a*. The position at which the secondary transfer roller **28***b* and the intermediate transfer belt **27** meet each other is referred to as the secondary transfer position.

The transfer section **28** is used to transfer the toner image formed on the intermediate transfer belt **27** to the surface of the sheet S at the secondary transfer position. The transfer section **28** applies a transfer bias at the secondary transfer position. The transfer section **28** transfers the toner image on the intermediate transfer belt **27** to the sheet S by using the transfer bias.

The fixing device **29** then applies heat and pressure to the sheet S. The fixing device **29** fixes the toner image to the sheet S by the heat and the pressure. The fixing device **29** is disposed above the transfer section **28**.

The transfer belt cleaning unit **35** faces the transfer belt roller **32**. The intermediated transfer belt **27** passes between transfer belt cleaning unit **35** and transfer belt roller **32**. The transfer belt cleaning unit **35** scrapes off toner from the surface of the intermediate transfer belt **27** as it passes.

Conveyance paths **30**A and **30**B for conveying the sheet S respectively pass between the registration roller pair **24** and the transfer section **28** and between the transfer section **28** and the fixing device **29**.

A conveyance path **30**C for discharging the sheet S in the X**2** direction is formed above the fixing device **29**. A discharge tray **9** on which sheets S discharged from the conveyance path **30**C can be placed is provided below the exit of the conveyance path **30**C.

A conveyance direction switching section **31** (sheet reversing section) that switches the conveyance direction of the sheet S is provided above the fixing device **29**.

A conveyance path **30**D that conveys the sheet S from the conveyance direction switching section **31** back to the registration roller pair **24** is formed inside the printer section **3** on the X**1** direction side from the conveyance paths **30**A and **30**B. For example, when performing double-sided printing, the conveyance path **30**D is used for reversing the one-sided printed sheet S for feeding the reversed sheet S to the registration roller pair **24** for second side printing.

The conveyance paths **30**A, **30**B, **30**C, and **30**D include various conveyance guide parts that face each other with the sheet S to be interposed therebetween, conveyance rollers provided as necessary for sheet conveyance.

The printer section **3** further includes a side cover unit **10**. The side cover unit **10** is provided at an end of the printer section **3** in the X**1** direction. An outer surface of the side cover unit **10** in the X**1** direction forms a side surface of the printer section **3** in the X**1** direction.

The side cover unit **10** includes a part of the above-described conveyance paths **30**A, **30**B, **30**C, and **30**D, the secondary transfer roller **28***b*, and the second roller **24***b*. Particularly, as for the conveyance paths **30**A and **30**B, the side cover unit **10** includes a conveyance guide part on the X**1** direction side of the conveyance paths **30**A and **30**B.

The side cover unit **10** is mounted on a main body portion of the printer section **3**. The side cover unit **10** is mounted so as to be rotatable about an axis extending in the Y direction. The side cover unit **10** can be opened and closed by a user using an integrated or attached part, such as a handle or a lever which in this instance are not separately illustrated on the side cover unit **10**.

When the conveyance guide part on the X**1** direction side of the conveyance paths **30**A and **30**B is rotated toward the X**1** direction with the side cover unit **10**, the conveyance guide part on the X**2** direction side of the conveyance paths **30**A and **30**B is exposed. Therefore, when a sheet S is jammed along one of the conveyance paths **30**A and **30**B, jam removal processing can be performed by opening the side cover unit **10**.

The main body control section **6** controls the various elements of the image forming apparatus **100**.

FIG. **2** is a schematic cross-sectional view illustrating an example of a side cover unit **10** in an image forming apparatus **100** according to an embodiment. FIG. **3** is a schematic perspective view illustrating an example of the side cover unit **10** according to the embodiment. FIG. **4** is a schematic cross-sectional view illustrating a relationship between the side cover unit **10** and an apparatus main body **101** (only a portion thereof is depicted in the figure) of the image forming apparatus **100** according to the embodiment.

FIG. **2** illustrates the side cover unit **10** when closed. Hereinafter, unless otherwise specified, the configuration of the side cover unit **10** will be described based upon a posture of the side cover unit **10** when closed/installed.

The side cover unit **10** includes a cover main body **11** and a transfer roller unit **12**.

The cover main body **11** includes an exterior part **11***a*, a conveyance part **11***b*, a registration roller holding part **11***c*, a transfer roller unit holding part **11***e*, and an engagement part **16**.

The exterior part **11***a* is the part exposed as the outside surface of the printer section **3** on the X**1** direction side. The exterior part **11***a* may include a jam processing cover, a manual feed unit, and the like to open (provide access to) the conveyance path **30**C at the conveyance part **11***b*

In this example, conveyance part **11***b* forms at least a part of the conveyance path **30**C. The conveyance part **11***b* is provided inside (X**2** direction side) of the exterior part **11***a*.

The registration roller holding part **11***c* holds the second roller **24***b* so that the first roller **24***a*, which is disposed on the apparatus main body side (side generally facing the interior of the imaging apparatus **100**), can be pressed by the second roller **24***b*.

A conveyance guide part **11***d* forming a part of the conveyance path from the conveyance roller **23** (refer to FIG. **1**) to the registration roller pair **24** is formed in the cover main body **11** near the registration roller holding part **11***c*.

The transfer roller unit holding part **11***e* holds the transfer roller unit **12**.

As illustrated in FIG. **3**, a hole **11***f* recessed in the Y**2** direction is provided on a side part in the Y**1** direction at a lower end part of the cover main body **11**. Although not specifically illustrated in FIG. **3**, another hole **11***f* is also provided on a side part in the Y**2** direction of the cover main body **11**. These two respective hole parts **11***f* are disposed coaxially with the first axis O**1** extending along the Y direction. Here, the hole **11***f* on the side part in the Y**2** direction is recessed in the Y**1** direction. The respective holes **11***f* have a mutually plane-symmetrical shape.

Support shafts **3***d*B and **3***d*F (refer to FIG. **5**), provided in the frame portion of the printer section **3** are to be inserted into the respective holes **11***f*. Accordingly, the cover main

body **11** is mounted so as to be rotatable about the first axis O**1** on the support shafts **3***d*B and **3***d*F.

Engagement parts **16** are fixed on both side surfaces in the Y direction of the cover main body **11**. Each engagement part **16** has a shape and arrangement mutually plane-symmetric with respect to a plane that bisects a distance between a front side plate **3***a* and a rear side plate **3***b* (see FIG. **5**) in the Y direction. Hereinafter, when distinguishing between the respective engagement parts **16** on different side, the engagement part **16** on the Y**1** direction side is referred as an engagement part **16**F, and the engagement part **16** on the Y**2** direction side is referred to as an engagement part **16**B.

Each engagement part **16** engages with a lever part **15***a* of a pressing mechanism **15** and moves the lever part **15***a* according to the opening and closing of the side cover unit **10**.

As illustrated in FIG. **2**, the transfer roller unit **12** includes the secondary transfer roller **28***b* and a unit main body **12**A.

The unit main body **12**A supports the secondary transfer roller **28***b*. The unit main body **12**A is contacts the transfer roller unit holding part **11***e* and can be separated from the transfer roller unit holding part **11***e*.

A first conveyance guide part **12***c*, a secondary transfer roller holding part **12***d*, and a second conveyance guide part **12***e* are formed on the X**2** direction side surface of the unit main body **12**A from the lower side to upper side.

The first conveyance guide part **12***c* faces a conveyance guide part **3***c* disposed in the apparatus main body **101** (or a frame portion) of the printer section **3**. The first conveyance guide part **12***c* forms the conveyance path **30**A together with the conveyance guide part **3***c*.

The secondary transfer roller holding part **12***d* is a recessed portion that accommodates the secondary transfer roller **28***b*. As illustrated in FIG. **3**, a bearing holder **12***g* and a locking shaft **12***b* are provided on a side surface of the transfer roller unit **12** in the Y**1** direction. In FIG. **3**, the bearing holder **12***g* and the locking shaft **12***b* have a shape and arrangement that are plane-symmetric to each other. The bearing holder **12***g* and the locking shaft **12***b* are also provided on a side surface of the unit main body **12**A in the Y**2** direction.

The bearing holders **12***g* and locking shafts **12***b* are used for positioning the transfer roller unit **12** inside the printer section **3**.

A bearing **12***f* and a locking member abutting part **12***h* are provided in each bearing holder **12***g*.

A shaft for the secondary transfer roller **28***b* is inserted through the bearings **12***f*. The bearing **12***f* thus rotatably supports the secondary transfer roller **28***b*.

When the side cover unit **10** is closed, the bearing **12***f* is locked to (engaged with) a locking member **14** inside the printer section **3**.

The locking member abutting part **12***h* is a recessed part extending in the Y direction and recessed upward. The locking member abutting part **12***h* can abut on a press roller **18**. The locking member abutting part **12***h* receives a pressing force from the press roller **18** when abutting the press roller **18**.

The locking shaft **12***b* extends in parallel with the bearing **12***f*, but below the bearing **12***f*. When the side cover unit **10** is closed, the locking shaft **12***b* is locked to the locking member **14** in the printer section **3**.

The unit main body **12**A provided with the bearing holder **12***g* and the bearing **12***f* is a support body that supports the secondary transfer roller **28***b*.

The second conveyance guide part **12***e* faces a corresponding conveyance guide part disposed in the printer section **3**. The second conveyance guide part **12***e* forms the conveyance path **30**B together with the corresponding conveyance guide part.

As illustrated in FIG. **3**, the cover main body **11** and the transfer roller unit **12** are connected (in the X-direction) to each other by links **13** at opposite end in the Y direction, respectively. FIG. **3** illustrates a state in which the link **13** is folded. In such a case, the transfer roller unit **12** is at its closest to the transfer roller unit holding part **11***e*, and the transfer roller unit **12** is held by the transfer roller unit holding part **11***e*.

The transfer roller unit holding part **11***e* is provided with an engagement holder **11***h* that serves to regulate movement of the transfer roller unit **12**. An engagement part **12***i* provided on the side of the transfer roller unit **12** in the Y**1** direction engages with the engagement holder **11***h*.

Specifically, as illustrated in FIG. **4**, an engagement shaft **12***j* protruding in the Y**1** direction is arranged in the engagement part **12***i*, and the engagement shaft **12***j* is inserted into a recessed portion of the engagement holder **11***h*. The recessed portion of the engagement holder **11***h* is formed in a polygonal shape capable of two-dimensionally guiding the engagement shaft **12***j* in a ZX plane. Accordingly, the transfer roller unit **12** is movably held by the transfer roller unit holding part **11***e* within an area of the recessed part of the engagement holder **11***h* and within a movable area of the link **13**. That is, when the side cover unit **10** is opened and closed, the recessed part of the engagement holder **11***h* includes a guide surface on which the engagement shaft **12***j* slides when gravity acts on the transfer roller unit **12**.

Although not particularly illustrated, the engagement holder **11***h*, the engagement part **12***i*, and the engagement shaft **12***j* having a shape and arrangement that are plane-symmetric with respect to a plane parallel to the ZX plane are also provided on a side part of the cover main body **11** and the transfer roller unit **12** in the X**2** direction.

In FIGS. **3** and **4**, of the links **13**, a link **13**F on the front side (Y**1** direction side) of the image forming apparatus **100** is illustrated.

The link **13**F includes a first link **13***a* and a second link **13***b*. A link **13** on the rear side (Y**2** direction side) of the image forming apparatus **100** depicted in FIG. **3** also includes a first link **13***a* and a second link **13***b* which are structurally the same as those of the link **13**F. Hereinafter, a configuration of each link **13** will be described with the example of the link **13**F.

As illustrated in FIG. **4**, an end part of the first link **13***a* in the X**1** direction is rotatably connected to the Y**1** direction side surface of the transfer roller unit holding part **11***e* via a rotating support shaft **13***c* extending in the Y direction.

Another end part of the first link **13***a* is connected to an end part of the second link **13***b* by a rotating joint **13***d*.

Another end part of the second link **13***b* is rotatably connected to the Y**1** direction side surface of the unit main body **12**A via a rotating support shaft **13***e* extending in the Y direction.

When the cover main body **11** rotates in a clockwise direction illustrated in FIG. **4**, each engagement shaft **12***j* slides on the guide surface in the recessed part of the engagement holder **11***h* due simply to the weight of the transfer roller unit **12**, and can move in an oblique direction descending as moving towards the X**2** direction. At this time, an opening angle of each link **13** would expand from the folded state illustrated in the drawing. At least a part of the transfer roller unit **12** can be separated from the transfer roller unit holding part **11***e* at this time.

Next, a relationship between the cover main body **11** and the apparatus main body **101** of the printer section **3** will be described.

FIG. **5** is a schematic perspective view illustrating the inside (from rear side angle) of the printer section **3** in the image forming apparatus **100** according to the embodiment. FIG. **6** is a schematic perspective view illustrating the inside (from front side angle) of the printer section **3** in the image forming apparatus **100** according to the embodiment.

As illustrated in FIG. **5**, the printer section **3** includes the front side plate **3***a* (as a main body frame portion) and the rear side plate **3***b* (as a main body frame portion).

The front side plate **3***a* and the rear side plate **3***b* are provided inside the front side (Y**1** direction side) and inside the rear side (Y**2** direction side) of the printer section **3**, respectively. The front side plate **3***a* and the rear side plate **3***b* are connected to each other by various spanning structures or components in the Y direction. For example, a conveyance guide part **20***a* on the apparatus main body side of the conveyance path **5** (see FIG. **1**) is installed below the front side plate **3***a* and the rear side plate **3***b*. The first roller **24***a* is disposed extending in the Y direction in the vicinity of the upper part of the conveyance guide part **20***a*.

A distance between the front side plate **3***a* and the rear side plate **3***b* is approximately equal to a width of the cover main body **11** in the Y direction.

The support shaft **3***d*B (rotating support part) protrudes in the Y**1** direction from the surface of the rear side plate **3***b*. The support shaft **3***d*F (rotating support part) protrudes in the Y**2** direction from the front sideplate **3***a*. The support shafts **3***d*B and **3***d*F are disposed coaxially with the first axis O**1**. Hereinafter, when it is not particularly required to distinguish between the support shafts **3***d*B and **3***d*F, each of the support shafts **3***d*B and **3***d*F may be simply referred to as a support shaft **3***d*.

Each support shaft **3***d* is inserted into a hole part **11***f* in the cover main body **11**, and is fitted to each hole part **11***f* so as to permit rotation about the first axis O**1**. Accordingly, the cover main body **11** is rotatably supported by support shafts **3***d* between the front side plate **3***a* and the rear side plate **3***b*.

As illustrated in FIG. **5**, on the Y**1** direction side facing surface of the rear side plate **3***b*, a locking member **14**B and a pressing mechanism **15**B are provided above the first roller **24***a* and the conveyance guide part **20***a*.

The locking member **14**B serves to position an end part of the transfer roller unit **12** of side cover unit **10**.

The pressing mechanism **15**B presses the end part of the transfer roller unit **12**, thereby pressing the transfer roller unit **12** against the locking member **14**B. The pressing of the pressing mechanism **15**B can be released with the rotation of the side cover unit **10** around the first axis O**1**.

As illustrated in FIG. **6**, a locking member **14**F and a pressing mechanism **15**F are provided on the Y**2** direction facing surface of the front side plate **3***a*.

The locking member **14**F and the pressing mechanism **15**F have a shape and arrangement that are plane-symmetric with respect to a plane that bisects the distance between the front side plate **3***a* and the rear side plate **3***b* in the Y direction. Accordingly, the locking member **14**F and the pressing mechanism **15**F respectively have the same functions as those of the locking member **14**B and the pressing mechanism **15**B with respect to an end part of the transfer roller unit **12**.

Hereinafter, when it is not particularly required to distinguish between the locking members **14**F and **14**B, each of the locking members **14**F and **14**B may be simply referred to as the locking member **14**. When it is not particularly required to distinguish between the pressing mechanisms **15**F and **15**B, each of the pressing mechanisms **15**F and **15**B may be simply referred to as a pressing mechanism **15**.

Hereinafter, configurations of the locking members **14** and the pressing mechanisms **15** will be described with an example of a locking member **14**F and a pressing mechanism **15**F.

As illustrated in FIG. **6**, the locking member **14**F includes a first locking groove **14***a* that engages the bearing **12***f* and a second locking groove **14***b* that engages the locking shaft **12***b*.

As illustrated in a cross-section shape of FIG. **4**, the first locking groove **14***a* includes an upper part **14***c* and a lower part **14***d*. The first locking groove **14***a* is open towards the X**1** direction.

The upper part **14***c* is a circular arc-shaped recessed part capable of covering an upper portion of the bearing **12***f* from above.

The lower part **14***d* is inclined obliquely downward (towards Z**2** direction) along the X**1** direction. Therefore, when the bearing **12***f* advances in the X**2** direction and abuts on the lower part **14***d*, the bearing **12***f* can be guided obliquely upward along the inclination of the lower part **14***d*. When the bearing **12***f* abuts on both the upper part **14***c* and the lower part **14***d*, the bearing **12***f* is appropriately positioned in a direction along the front side plate **3***a* by the first locking groove **14***a*.

The second locking groove **14***b* serves to position the transfer roller unit **12** around the rotation center of the bearing **12***f* as positioned in the first locking groove **14***a*.

The second locking groove **14***b* includes a lower part **14***e*, an upper part **14***g*, and an inlet guide part **14***f*.

The lower part **14***e* and the upper part **14***g* are formed by plate-shaped parts that are parallel to each other, and form a groove part opening obliquely upward along the X**1** direction. A width between the lower locking part **14***e* and the upper locking part **14***g* is a size that allows the locking shaft **12***b* to be slidably fitted.

The inlet guide part **14***f* receives a lower surface of the locking shaft **12***b* from below and guides the locking shaft **12***b* toward an opening between the lower locking part **14***e* and the upper locking part **14***g*. The inlet guide part **14***f* extends obliquely upward at an angle shallower than the inclination of the lower locking part **14***e* from an end part of the opening side of the lower locking part **14***e* disposed below the upper locking part **14***g*.

The locking member **14**F is formed of, for example, a resin molded product having good slidability with the outer periphery of the bearing **12***f* and the locking shaft **12***b*. The locking member **14**F is fixed to the front side plate **3***a* by, for example, a screw.

As illustrated in FIG. **6**, a rotating support shaft **17**F extending in the Y**2** direction from the front side plate **3***a* is inserted into the pressing mechanism **15**F. The central axis of the rotating support shaft **17**F is a second axis O**2** that is parallel to the first axis O**1**. The pressing mechanism **15**F is rotatably supported around the second axis O**2** by the rotating support shaft **17**F.

As illustrated in FIG. **5**, a rotating support shaft **17**B extending in the Y**1** direction coaxially with the second axis O**2** from the rear side plate **3***b* is inserted into the pressing mechanism **15**B. The pressing mechanism **15**B is rotatably supported around the second axis O**2** by the rotating support shaft **17**B.

Hereinafter, when it is not particularly required to distinguish between the rotating support shafts **17**F and **17**B, each

of the rotating support shafts **17**F and **17**B may be simply referred to as a rotating support shaft **17**.

The pressing mechanism **15**F illustrated in FIGS. **7** and **8** depicts a posture that would occur when pressing on the transfer roller unit **12** as positioned by locking members **14**. Hereinafter, unless otherwise specified, the configuration of each part of the pressing mechanism **15**F will be described by reference this particular posture, though as described the posture is changeable.

The pressing mechanism **15**F includes: a hole part **15***c* for rotatably fitting the rotating support shaft **17**F which is not illustrated; the lever part **15***a* extending from the outside of the hole part **15***c*; and a pressing part **15***b* provided toward the X**2** direction side from the hole part **15***c*.

The lever part **15***a* extends in an oblique direction toward the Z**2** direction as advancing in the X**1** direction. Particularly, a protruding part **15***m* extending in the above-described direction along an axis orthogonal to the second axis O**2** is formed at a tip part of the lever part **15***a* in the extending direction. A surface on the X**1** direction side in the protruding part **15***m* is formed by a first surface **15***d*, and a surface on the X**2** direction side in the protruding part **15***m* is formed by a second surface **15***e*, respectively. The first surface **15***d* and the second surface **15***e* are planes that are parallel to each other. A distance between the first surface **15***d* and the second surface **15***e* is indicated by W**15***m*.

A tip of the protruding part **15***m* in the Z**2** direction is formed of a lower surface **15***n* along an approximately horizontal plane. Therefore, a distance R**15***a* between a tip edge part **15***f* formed at an intersection of the lower surface **15***n* and the first surface **15***d* and the second axis O**2** represents a rotation radius of the lever part **15***a* when the lever part **15***a* rotates around the second axis O**2**.

The pressing part **15***b* presses the locking member abutting part **12***h* from below.

As illustrated in FIG. **8**, the pressing part **15***b* includes the press roller **18**, a press roller holder **15***i*, a holder guide part **15***g*, and a spring **19**.

The press roller **18** is rotatably supported by a rotating support shaft **18***a* extending in the Y direction. The press roller **18** can abut against the locking member abutting part **12***h* from below.

The press roller holder **15***i* supports the rotating support shaft **18***a* at an upper part. A spring accommodating part **15***p*, which holds an upper end part of the spring **19**, is provided below the press roller holder **15***i*.

A guide shaft **15***k* extending in the longitudinal direction of the holder guide part **15***g* protrudes downward at a central part of the spring accommodating part **15***p*.

The holder guide part **15***g* is a tubular part that is long in the Z direction and open at an upper part. Inside the holder guide part **15***g*, the press roller holder **15***i* is movably accommodated along the longitudinal direction thereof.

A guide hole **15***j* through which the guide shaft **15***k* is inserted passes through a central part of a bottom surface **15***h* of the holder guide part **15***g*. The spring **19** is formed of a compression coil spring and is inserted between the bottom surface **15***h* and the spring accommodating part **15***p*. Further, since the spring **19** in FIG. **8** depicts a state during pressing, the spring **19** is compressed more than in its natural, uncompressed state.

The guide shaft **15***k* passes through the inside of the coil of spring **19** and is inserted into the guide hole **15***j*. A stopper part **15***q* is formed at a tip part of the guide shaft **15***k* by, for example, a C ring, or the like.

Next, a detailed configuration example of the engagement part **16** will be described with an example of the engagement part **16**F.

FIG. **9** is a schematic perspective view illustrating an example of the engagement part in the image forming apparatus according to the embodiment.

As illustrated in FIG. **9**, the engagement part **16**F protrudes in the Y**1** direction from a side surface part **11***g* of the cover main body **11** in the Y**1** direction. The engagement part **16**F is formed in an approximately U-shaped groove shape having a groove part **16***c* that is recessed in the approximately X**1** direction as a whole when viewed from the Y direction. More specifically, the groove part **16***c* has a groove shape in which respective end parts in the X**1** direction of a groove inner surface **16***e* on the Z**2** direction side extending in the X direction and a groove inner surface **16***g* on the Z**1** direction side formed of a slope toward the Z**2** direction as advancing in the X**1** direction are connected by a curved surface **16***g* protruding in the X direction.

A protruding amount of the engagement part **16**F is wider than a width of the lever part **15***a* in the Y direction in the pressing mechanism **15**F.

A first pressing part **16***a* and a second pressing part **16***b* extending in the Y direction are formed at respective opening ends of the groove part **16***c* in the Z**1** direction and the Z**2** direction. A rectangular-shaped opening part **16***d* that is open in the approximately X**2** direction and communicated with the groove part **16***c* is formed between the first pressing part **16***a* and the second pressing part **16***b*.

As illustrated in FIG. **4**, the first pressing part **16***a* protrudes in the X**2** direction from an opening end on the Z**1** direction side in the groove part **16***c*. A tip part of the first pressing part **16***a* in the protruding direction is rounded in a circular arc shape.

The second pressing part **16***b* protrudes in the Z**1** direction from an opening end on the Z**2** direction side in the groove part **16***c*. A tip part of the second pressing part **16***b* in the protruding direction is rounded in a circular arc shape.

Each tip of the first pressing part **16***a* and the second pressing part **16***b* in the protruding direction is aligned on a plane slightly more inclined in the X**1** direction than a vertical plane. Therefore, when counterclockwise angles illustrated in the drawing from the vertical plane including the first axis O**1** and orthogonal to the X direction to the first pressing part **16***a* and the second pressing part **16***b* are respectively represented as θ**1** and θ**2** (where θ**1** and θ**2** are acute angles), θ**2** is larger than θ**1**.

That is, when a rotating direction (counterclockwise direction as illustrated in the drawing) that rotates from an open state of the cover main body **11** to a closed state thereof is defined as a positive direction, each second pressing part **16***b* in the cover main body **11** is provided at a position where each second pressing part **16***b* rotates more in the positive direction than each first pressing part **16***a*.

When the side cover unit **10** illustrated in FIG. **4** is closed, the engagement part **16**F is disposed at a position where the lever part **15***a* of the pressing mechanism **15**F is inserted into the groove part **16***c* and the first pressing part **16***a* abuts on the first surface **15***d* of the lever part **15***a*. Such an arrangement position of the lever part **15***a* is a first position where the pressing part **15***b* presses the unit main body **12**A via the locking member abutting part **12***h*.

At the first position, the second surface **15***e* of the lever part **15***a* is more separated in the X**1** direction than the second pressing part **16***b*, and the lower surface **15***n* is more separated in the Z**1** direction than the groove part **16***c*.

According to the configuration, each first pressing part **16***a* and each second pressing part **16***b* are disposed in opposite directions with the lever part **15***a* interposed therebetween when the cover main body **11** is closed.

A rotation radius R**16***b* of the second pressing part **16***b* around the first axis O**1** is shorter than a rotation radius R**16***a* of the first pressing part **16***a* around the first axis O**1**.

In the embodiment, the rotation radii R**16***a* and R**16***b* are both longer than the rotation radius R**15***a* around the second axis O**2** of the lever part **15***a*.

A rotation trajectory of the tip of the lever part **15***a* represented by a circular arc of the radius R**15***a* around the second axis O**2** intersects with a rotation trajectory of the tips of the first pressing part **16***a* and the second pressing part **16***b* represented by circular arcs of the radii R**16***a* and R**16***b* around the first axis O**1**.

As described above, when the side cover unit **10** is closed, the first pressing part **16***a* presses the first surface **15***d*, whereby a rotation position around the second axis O**2** of the pressing mechanism **15**F is set to the first position. At this time, the pressing roller **18** in the pressing mechanism **15**F is fitted to the locking member abutting part **12***h* from below, and presses the locking member abutting part **12***h* upward.

Thus, a moment by an external force from the locking member abutting part **12***h* acts on the transfer roller unit **12**, after which the bearing **12***f* is locked to the first locking groove **14***a*, and the locking shaft **12***b* is locked to the second locking groove **14***b*, respectively.

In the above, the engagement between the pressing mechanism **15**F and the engagement part **16**F when the side cover unit **10** is closed, and the locking state between the transfer roller unit **12** and the locking member **14**F at the side surface part in the Y**1** direction are described. Although not specifically illustrated, the same also applies to engagement between the pressing mechanism **15**B and the engagement part **16** on the Y**2** direction side at the side surface part in the Y**2** direction, and a locking state between the transfer roller unit **12** and the locking member **14**B at the side surface part in the Y**2** direction.

Next, an operation of the image forming apparatus **100** will be described focusing on an operation thereof when the side cover unit **10** is opened and closed.

First, an image forming operation of the image forming apparatus **100** will be briefly described.

In the image forming apparatus **100** illustrated in FIG. **1**, image formation is started by an operation of the control panel **1** or an external signal. Image information is transmitted to the printer section **3** by the scanner section **2** reading an object to be copied, or transmitted to the printer section **3** from the outside. The printer section **3** supplies the sheet S from the sheet supply section **4** to the registration roller **24**. The main body control section **6** selects the sheet S supplied from the sheet supply section **4** based upon the operation of the control panel **1** or the external signal.

When an operation input of the image formation is performed from the control panel **1**, the main body control section **6** performs control for starting paper feeding from the paper feeding cassette and the image formation.

The image forming sections **25**Y, **25**M, **25**C, and **25**K form an electrostatic latent image on each photosensitive drum **7** based upon the image information corresponding to each color. Each electrostatic latent image is developed by the developing device **8**. Therefore, a toner image corresponding to the electrostatic latent image is formed on the surface of each photosensitive drum **7**.

Each toner image is primarily transferred to the intermediate transfer belt **27** by each transfer roller. As the intermediate transfer belt **27** moves, each toner image is sequentially superimposed without causing color shift and sent to the transfer section **28**.

The sheet S is fed from the registration roller pair **24** to the transfer section **28**. The toner image reaching the transfer section **28** is then transferred to the sheet S. The transfer of the toner image from the transfer section **28** to the sheet S is referred to as a secondary transfer. The transferred toner image is then fixed on the sheet S by the fixing device **29**. An image is thus formed on the sheet S.

Next, the operation when the side cover unit **10** is opened and closed will be described.

FIGS. **10** to **12** are operation explanatory views in the image forming apparatus according to the embodiment.

In addition, in FIGS. **10** to **12**, with respect to the members disposed on the opposite sides in the Y direction, only the members on the Y**1** direction side are illustrated. Therefore, hereinafter, an operation of the members on the Y**1** direction side will be described. However, the same operation is realized by the corresponding members on the Y**2** direction side.

FIG. **10** illustrates a state when the side cover unit **10** is closed, which is the same as that of FIG. **4**. Here, the illustration of the locking member **14**F is omitted.

When a user manipulates an operation part such as a handle, the side cover unit **10** can be opened in the X**1** direction from a closed state.

At this time, the cover main body **11** in the side cover unit **10** rotates around the first axis O**1** in the clockwise direction illustrated in the drawing. Since the engagement part **16**F is fixed to the side surface part of the cover main body **11**, the engagement part **16**F rotates around the first axis O**1** in the clockwise direction illustrated in the drawing in the same manner as that of the cover main body **11**.

For example, when viewed from the Y direction, the first pressing part **16***a* and the second pressing part **16***b* rotate and move while drawing circular arc trajectories of the rotation radii R**16***a* and R**16***b*, respectively.

When the cover main body **11** starts to rotate, the first pressing part **16***a* is separated from the first surface **15***d* in the rotating direction, and the second pressing part **16***b* abuts on the second surface **15***e*. Further, when the rotation proceeds, the second pressing part **16***b* presses the second surface **15***e* in the rotating direction.

By a pressing force from the second pressing part **16***b*, a counterclockwise moment illustrated in the drawing acts on the lever part **15***a* of the pressing mechanism **15**F with respect to the second axis O**2**. For this reason, the lever part **15***a* rotates around the second axis O**2** in the counterclockwise direction illustrated in the drawing.

As a result, the lever part **15***a* is moved from the first position to the second position where the press roller **18** rides over an end part of the locking member abutting part **12***h* in the X**2** direction. Thus, a force acting on the transfer roller unit **12** from the pressing mechanism **15**F through the press roller **18** is released.

When moving to the second position, the spring **19** which is illustrated in an uncompressed state in association with an overriding operation of the press roller **18**. Therefore, an operating force for rotating the side cover unit **10** is temporarily increased by the reaction from the pressing mechanism **15**F. However, the second pressing part **16***b* is in contact with the tip part of the lever part **15***a* in the protruding direction. Therefore, in comparison with a case of abutting on a position closer to the second axis O**2**, the lever action is increased and thus the operating force is reduced.

When the pressing mechanism **15**F further rotates in the counterclockwise direction as illustrated in the drawing, the extending direction of the lever part **15***a* approaches horizontal by rotation of the lever part **15***a*. As a result, the lever part **15***a* can pass between the opening parts **16***d* in the engagement part **16**F. Accordingly, as illustrated in FIG. **11**, engagement between the lever part **15***a* and the engagement part **16** is released, and the engagement part **16** can be smoothly separated from the pressing mechanism **15** in the rotating direction.

Accordingly, the cover main body **11** can further rotate in the X**1** direction.

In the pressing mechanism **15**F released from the engagement with the engagement part **16**F and the abutting against the locking member abutting part **12***h*, the lever part **15***a* as illustrated in the drawing is maintained around the second axis O**2** in a nearly horizontal posture by balance of mass. That is, in the pressing mechanism **15**F, since the mass of the pressing part **15***b* is greater than that of the lever part **15***a*, the pressing mechanism **15**F has a posture in which the pressing part **15***b* is on the lower side.

Here, in the posture described above, the tip part of the lever part **15***a* in the protruding direction is interposed between a rotation trajectory T**1** of the tip part of the first pressing part **16***a* and a rotation trajectory T**2** of the tip part of the second pressing part **16***b*.

As illustrated in FIG. **11**, when the cover main body **11** is inclined, the transfer roller unit **12** is inclined at an angle different from that of the cover main body **11** by the self-weight of the transfer roller unit **12**. Thus, an angle formed by the first link **13***a* and the second link **13***b* in the link **13** increases. The transfer roller unit **12** is inclined in a direction approaching horizontal on the transfer roller unit holding part **11***e*. Accordingly, a position of the bearing **12***f* with respect to the locking shaft **12***b* falls in the X**1** direction, and the bearing **12***f* further moves toward the X**1** direction in the X direction.

FIG. **12** illustrates a state in which the cover main body **11** is rotated as much as possible in the X**1** direction. By the time the aforementioned state is reached, the transfer roller unit **12** moves to a position held on the transfer roller unit holding part **11***e* by the mass balance, similarly to the case when the side cover unit **10** is closed. Therefore, an opening angle between the first link **13***a* and the second link **13***b* in the link **13** is also the same as an opening angle at the time of closing.

In this manner, when the cover main body **11** is rotated as much as possible in the X**1** direction, the side cover unit **10** is opened.

When side cover unit **10** is opened, the transfer roller unit **12** is held at a fixed position on the transfer roller unit holding part **11***e*. Accordingly, the secondary transfer roller **28***b* is separated from the intermediate transfer belt **27**. A roller surface of the secondary transfer roller **28***b* is directed toward the Z**1** direction.

The first conveyance guide part **12***c* and the second conveyance guide part **12***e* in the transfer roller unit **12**, and the conveyance guide part **11***d* in the cover main body **11** are separated from respective conveyance guide parts on the apparatus main body side, which face each other. Thus, a part of the conveyance path of the conveyance mechanism **5**, and the conveyance paths **30**A and **30**B are open.

Therefore, when the jam of the sheet S occurs at a part of the conveyance path of the conveyance part **5** and any part of the conveyance paths **30**A and **30**B, the jammed sheet S can be removed by opening the side cover unit **10**.

Hereinabove, the operation of the side cover unit **10** is described from the closed state of the side cover unit **10** to the open state thereof. When the above-described operation is performed in reverse, the side cover unit **10** can be closed from the open state thereof.

At that time, when the user simply closes the cover main body **11**, each engagement part **16** is engaged with the lever part **15***a* of each pressing mechanism **15**, and each first pressing part **16***a* presses the first surface **15***d* in the positive direction of rotation, whereby each press roller **18** abuts on each locking member abutting part **12***h* as each pressing mechanism **15** rotates around the second axis O**2** in the clockwise direction illustrated in the drawing. At this time, the spring **19** in each pressing part **15***b* is compressed, whereby a force is applied to both end parts of the transfer roller unit **12** in the Y direction.

Since the force of the spring **19** is applied in a direction slightly inclined in the X**2** direction with respect to the Z**1** direction, the horizontal component force is extremely small. Therefore, at the end of closing, in order to resist a reaction force component of the spring **19** in the X**1** direction, it is not necessary for a user to substantially increase the force when the side cover unit **10** is closed. Therefore, with the image forming apparatus **100** according to an embodiment, the user can easily open and close the side cover unit **10**.

When the side cover unit **10** is closed, each bearing **12***f* and each locking shaft **12***b* of the transfer roller unit **12** are locked to the respective locking members **14**, and thus the posture of the transfer roller unit **12** is fixed. At this time, the secondary transfer roller **28***b* abuts on the intermediate transfer belt **27** at the secondary transfer position, and a nip for the secondary transfer is formed.

As described above, with the image forming apparatus **100** according to an embodiment, when the cover main body **11** is closed, the engagement part **16** is engaged with the lever part **15***a* of the pressing mechanism **15**. Accordingly, the lever part **15***a* is rotated around the second axis O**2**, and the transfer roller unit **12** is locked to the locking member **14**. As a result, the secondary transfer roller **28***b* is positioned at the secondary transfer position in the intermediate transfer belt **27**. While the cover main body **11** is open, the engagement between the engagement part **16** and the lever part **15***a* is released in response to the rotation of the cover main body **11**, and accordingly, the transfer roller unit **12** including the secondary transfer roller **28***b* rotates together with the cover main body **11**, and the secondary transfer roller **28***b* is separated from the intermediate transfer belt **27**. As a result, the conveyance path is opened.

At the time of the above-described opening and closing, the force acting on the transfer roller unit **12** from the pressing mechanism **15** hardly contributes to the increase or decrease of the force necessary for the opening and closing operation of the cover main body **11**.

Therefore, the user can smoothly open and close the cover main body **11**.

Thus, the cover can be smoothly opened and closed, and it is possible to provide an image forming apparatus capable of accurately positioning the roller with respect to the rotating body when the cover is closed.

Hereinafter, a modification example of the above-described example embodiment will be described.

In the above description, the first pressing part **16***a* and the second pressing part **16***b* are formed at the opening end of the groove part **16***c*. However, a space that does not interfere with the lever part **15***a* may be formed between the first pressing part **16***a* and the second pressing part **16***b*. The

space need not form a groove. For example, the first pressing part and the second pressing part may be formed with pin members.

In the above description of the example embodiment, the engagement part **16** is described as including the first pressing part **16***a* and the second pressing part **16***b*. However, the engagement part is not limited to this configuration and, in general, any configuration can be adopted as long as the engagement part **16** can move a lever between a first position and a second position in association with the rotation of the cover. For example, the engagement part **16** may move the lever between the first position and the second position by pulling rather than pushing the lever in association with the rotation of the cover.

In the description of the example embodiment, it is described that the rotation radius of the second pressing part **16***b* is smaller than the rotation radius of the first pressing part **16***a* around the first axis O**1**. However, as long as the engagement can be released in such a manner that the lever passes between the first pressing part and the second pressing part, the rotation radius of the second pressing part **16***b* may be larger than the rotation radius of the first pressing part **16***a*. In such a case, resistance at the time of closing the cover may become smaller.

While certain embodiments have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the present disclosure. Indeed, the novel embodiments described herein may be embodied in a variety of other forms; furthermore, various omissions, substitutions and changes in the form of the embodiments described herein may be made without departing from the spirit of the present disclosure. The accompanying claims and their equivalents are intended to cover such forms or modifications as would fall within the scope and spirit of the present disclosure.

What is claimed is:

1. An image forming apparatus, comprising:
- a main body;
- a rotating belt in the main body;
- a roller supported by a support shaft that is configured to move the roller into contact with the rotating belt and to separate the roller from the rotating belt;
- a pressing part in the main body configured to press the support shaft so that the roller presses against the rotating belt;
- a lever that when moved causes the pressing part to move between a first position pressing the support shaft and a second position away from the support shaft;
- a cover covering an outer periphery of the main body, the cover being rotatably supported about a first axis of a rotating support part in the main body so as to be openable and closable; and
- an engagement part that is fixed to the cover and moves on a circular arc around the first axis with rotation of the cover, the engagement part being positioned to engage the lever when the cover is closed such that the lever is at the first position and to release the lever when the cover is opened to permit the lever to move to the second position.

2. The image forming apparatus according to claim **1**, wherein the engagement part includes:
- a first pressing part that presses the lever toward the first position when the cover is closed; and
- a second pressing part that presses the lever in a direction opposed to a pressing direction of the first pressing part when the cover is opened.

3. The image forming apparatus according to claim **2**, wherein a rotation radius of the second pressing part around the first axis is less than a rotation radius of the first pressing part around the first axis.

4. The image forming apparatus according to claim **2**, wherein the first pressing part and the second pressing part are separable from the lever when the cover is opened.

5. The image forming apparatus according to claim **2**, wherein when the cover rotates from an open state to a closed state, the second pressing part is positioned to rotate further than the first pressing part in the direction in which the cover rotates from the open state to the closed state.

6. The image forming apparatus according to claim **2**, wherein the lever is interposed between the first pressing part and the second pressing part when the cover is in a closed state.

7. The image forming apparatus according to claim **1**, wherein the cover when open exposes a conveyance path for a sheet.

8. The image forming apparatus according to claim **1**, wherein the roller is a secondary transfer roller.

9. The image forming apparatus according to claim **1**, further comprising:
- a rotating member configured to rotate around a second axis parallel to the first axis, wherein
- the pressing part and the lever are on the rotating member, and
- the lever is positioned such that a rotational trajectory of the lever intersects with a rotational trajectory of the engagement part when the cover rotates.

10. The image forming apparatus according to claim **9**, wherein a rotation radius of the lever around the second axis is shorter than a rotation radius of the pressing part around the first axis.

11. An image forming apparatus, comprising:
- a main body;
- a sheet conveyance path along which a sheet passes in the main body for processing of the sheet;
- a rotating belt configured to contact the sheet on the conveyance path;
- a roller supported by a support shaft that is configured to move the roller into contact with the rotating belt and to separate the roller from the rotating belt;
- a pressing part in the main body configured to press the support shaft so that the roller presses against the rotating belt;
- a lever that when moved causes the pressing part to move between a first position pressing the support shaft and a second position away from the support shaft;
- a cover on the main body, the cover being rotatably supported about a first axis of a rotating support part in the main body so as to be openable and closable, the cover when in an open state exposing a portion of the sheet conveyance path; and
- an engagement part that is fixed to the cover and moves on a circular arc around the first axis with rotation of the cover, the engagement part being positioned to engage the lever when the cover is closed such that the lever is at the first position and to release the lever when the cover is opened to permit the lever to move to the second position.

12. The image forming apparatus according to claim **11**, wherein the engagement part includes:
- a first pressing part that presses the lever toward the first position when the cover is closed; and

a second pressing part that presses the lever in a direction opposed to a pressing direction of the first pressing part when the cover is opened.

13. The image forming apparatus according to claim **12**, wherein a rotation radius of the second pressing part around the first axis is less than a rotation radius of the first pressing part around the first axis.

14. The image forming apparatus according to claim **12**, wherein the first pressing part and the second pressing part are separable from the lever when the cover is opened.

15. The image forming apparatus according to claim **12**, wherein when the cover rotates from an open state to a closed state, the second pressing part is positioned to rotate further than the first pressing part in the direction in which the cover rotates from the open state to the closed state.

16. The image forming apparatus according to claim **12**, wherein the lever is interposed between the first pressing part and the second pressing part when the cover is in a closed state.

17. The image forming apparatus according to claim **11**, wherein the roller is a secondary transfer roller.

18. A printer apparatus, comprising:

a main body including therein an image forming unit configured to form toner images on a transfer belt;

a sheet conveyance path along which a sheet passes in the main body to contact the transfer belt;

a roller supported by a support shaft that is configured to move the roller into contact with the transfer belt and to separate the roller from transfer belt;

a pressing part in the main body configured to press the support shaft so that the roller presses against the transfer belt;

a lever that when moved causes the pressing part to move between a first position pressing the support shaft and a second position away from the support shaft;

a cover on the main body, the cover being rotatably supported about a first axis of a rotating support part in the main body so as to be openable and closable, the cover when in an open state exposing a portion of the sheet conveyance path; and

an engagement part that is fixed to the cover and moves on a circular arc around the first axis with rotation of the cover, the engagement part being positioned to engage the lever when the cover is closed such that the lever is at the first position and to release the lever when the cover is opened to permit the lever to move to the second position.

19. The printer apparatus according to claim **18**, wherein the engagement part includes:

a first pressing part that presses the lever toward the first position when the cover is closed; and

a second pressing part that presses the lever in a direction opposed to a pressing direction of the first pressing part when the cover is opened.

20. The printer apparatus according to claim **19**, wherein the lever is interposed between the first pressing part and the second pressing part when the cover is in the closed state.

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